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ON TREATMENT

BY

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PREFACE

In this work the writer treats of certain questions of therapeutics from his individual point of view. He has, accordingly, allowed himself free use of the first personal pronoun, and for this he ventures to hope he may rely upon the indulgence of the reader.

Wimpole Street, W.,
May, 1907.

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CHAPTER I

THE EDUCATION OF THE PHYSICIAN

Modern medical education fails in many ways, and in none more than this—that it often loses sight of its goal. None will dispute that the physician should seek as far as possible so to regulate his studies as to make him in good truth a healer of the sick. Yet this is so much lost sight of—overlaid, as it were—in our medical schools, that it is quite a common thing to come across such a passage in a text-book as, "It must never be forgotten that the whole object of medical education is to make the doctor a good practical man—to teach him to prevent and cure diseases." Faulty, indeed, must be our system of medical education if we need to be constantly reminded in this half-apologetic way of its very *raison d'être.*

Much of the student's time is wasted on useless topics. Minute anatomy, which can never be put to any practical use, is taught, while on the other hand anatomy of the most practical import is often not taught at all. When teaching anatomy, I used constantly to be discovering my ignorance of some important landmark. It was some time, *e.g.*, before I realized that the aortic pulsation felt in the epigastrium is caused by the thoracic, and not by the abdominal, aorta, and that the vessel we

feel pulsating in this region actually lies behind the diaphragm.

But if our system of teaching anatomy is faulty, what shall be said of the teaching of physiology? The text-books on physiology which the student has to read are so voluminous and involved, the well-established and important principles are so interlarded with irrelevant facts and vague speculations, that his bewildered brain comes to mistake mere phrases for actual knowledge. What is the use of teaching him, almost before he has had time to realize even that he is a student, about A, B, and C peptones? That is not teaching him physiology; it is merely cramming him with so much meaningless jargon.

Numbers of students, conscientious workers too, have passed through my hands, but I have scarcely ever come across one who had any real grasp of this subject. The fact is, physiology is in its infancy, and it is very difficult to teach a science at this early stage of its evolution. But it is a great thing to be conscious of our ignorance, and the sooner medical teachers realize that the most learned physiologist living is still but in the twilight as regards the matters he makes his special study, the better for all concerned. I remember how for years I laboured to master a certain subject in physiology, generally held to be thoroughly understood, until finally I discovered that the physiologists themselves did not grasp the crux of it. What our students want is a small book on physiology, setting forth well-established general principles, isolated facts and speculations being rigidly excluded, and attention mainly directed to what is likely to be of practical use.

And here let me caution the physician against the danger he is running when he attempts to apply his physiological knowledge in treating disease. I shall have

more to say on this subject when I come to speak of rational, as distinguished from empirical, therapeutics, but meanwhile I would observe that I entirely disagree with a late distinguished physician who, regarding medicine as applied physiology, held that the best physiologist makes the best physician. Were physiology a matured science there would be much truth in this view, but in its present embryonic phase the doctrine is, I feel assured, disastrously fallacious. I do not, of course, say there are not isolated cases where physiology may come to the physician's aid, and I believe that one day it will be of great service to him. I merely want to utter a caution against the belief that an intimate acquaintance with an embryo science is likely to be of any real help, and to beg the young physician not to rely too confidently on his physiology in treatment. The ultra-physiological physician—we all know him—whose bedside talk savours of the laboratory, is simply intoxicated with useless, if not dangerous, pseudo-learning, and, to me at least, seems but little in advance of the alchemist of old. I have learned utterly to mistrust him. In order to point these remarks, let me ask the reader if he really believes that an intimate acquaintance with the vast nescience of physiological chemistry would help him one jot in the treatment of, say, dyspepsia or gout, or whether it would not rather blur his vision and thwart him in the exercise of his common sense.

Scarcely less irrational than the teaching of physiology is the method of teaching drug therapeutics—the compelling the unhappy student to learn minute details concerning the physiological action of medicines, with the inevitable and dangerous result that one day he attempts to apply the knowledge so laboriously acquired. The assumption that he can administer drugs on such a

"rational basis" carries with it the further assumption that he has a profound knowledge of how they behave in the body, and an equally profound knowledge of the morbid processes going on in that special body for which he prescribes them.

It will be seen that I am no enthusiastic supporter of our present system of teaching minute anatomy, speculative physiology, and physiological therapeutics. But it may be argued that such teaching at least affords good mental training; that it educates eye and hand while inducing habits of observation and reflection; and there is some truth in this. But surely the same ends may be achieved in other and more useful ways? The eye and the hand can be as well trained by practice with the ophthalmoscope and the laryngoscope as by dissecting out the petrosal nerves, while the diagnosis of disease educates the reflective powers every whit as effectively as does the study of speculative physiology.

As with his earlier, so with his later studies, the criterion of the student's education should be usefulness; in other words, his energies should be directed to the acquisition of knowledge capable of practical application. So far as surgery is concerned, this end is kept steadily in view. Not so, however, with the sister science, medicine. Here much time is spent in learning what can never be turned to practical account. A detailed knowledge of symptomatology, as set forth in some of the books, merely cumbers the mind and confuses the main issues. Barren accounts of morbid anatomy, macroscopic and microscopic, are equally baneful, while speculative pathology is yet more pernicious. Why not, when we are wholly ignorant of the pathology of a disease, honestly tell the student so, instead of further overweighting the already overweighted vessel with a use-

less cargo of surmise? The time thus saved would be invaluable for acquiring really useful knowledge—in studying gynæcology, diseases of children, of the eye, ear, nose, throat, skin—all of which should be studied with a special view to their treatment, most time being devoted to those diseases which are most amenable to treatment. It is idle, for instance, to ask the average student to acquire a minute clinical knowledge of organic nervous affections for which little or nothing can be done, and yet more idle to compel him to get up their detailed morbid anatomy and pathology. As things are, he often wades through thousands of words in search of light and guidance, to find in the end only some two or three lines devoted to the practical subject of treatment.

Observe, too, that it is the man most deeply versed in symptomatology, morbid anatomy, and pathology who is most apt to make light of treatment. He becomes so saturated with, and fascinated by, this kind of knowledge, that in the end he actually deludes himself into believing that in the mere investigation and record of symptoms he is fulfilling his duty by the patient.

We may see a physician of this sort fill page after page with notes on a case, follow this up by a learned exposition to students, and then, while with one hand sounding the bell for the "next," rapidly dash off with the other a prescription for the affrighted patient, who, without any further direction, is hurried away to make room for the new-comer. With such a man the investigation of symptoms has become a hobby, or, rather, an obsession, filling his mind to the exclusion of all else. Yet it is a very poor type of physician who, lost in a maze of symptomological detail, takes no account of the patient's individuality and habits of life, and sums up all his treatment in a medicine bottle. He serves but to

illustrate a well-known psychological law — the tendency, namely, for the means to an end to become an end in itself, as familiarly instanced by the miser. A knowledge of symptoms is valuable as affording a means to diagnosis, prognosis, and treatment; but the ultra-symptomatologist gathers up symptoms in his memory much as the miser hoards his coins—not for the sake of any good that can be got from them, but for the sheer pleasure of collecting them and finding them multiply.

I have said that the student should concentrate his attention on those diseases which are most amenable to treatment. For this reason I would insist upon his devoting as much time as possible to such disorders as those of the eye and skin. Not only is the study of these branches of medicine highly interesting—not only does it cultivate the faculty of observation, so invaluable to the physician—but, best of all, it enables him to do a large amount of good in practice, and to be to a great extent independent of the specialist.

I may confess at once that I am one of those who deplore the growing tendency to specialism. Within proper limits specialism is desirable. It is an instance of that division of labour which is a necessary accompaniment of evolution, be it organic or sociological, and now we observe it in all save the most narrow callings. I do not know if chimney-sweeps specialize in their own line, but I should not be surprised to hear that they did. To such an extent is specialism now carried that special departments of medicine and surgery are sub-specializing, so to speak: thus, in America, dental surgery is being split up into sections—one man devoting himself to extraction, another to regulation work, a third to fillings, and a fourth to dentures.

Specialism within proper limits has, I say, its advan-

tages. The lifelong devotion of earnest and capable workers to the study of one class of diseases has advanced, and will continue to advance, medicine; further, a great deal of medical consultation work can only legitimately be undertaken by a specialist, for he alone has the time to master the intricacies of his subject, and he moreover constitutes for the practitioner* a sort of final Court of Appeal in doubtful and difficult cases. But when all has been said for it, specialism has serious dangers and disadvantages. Almost all physicians are now "specializing," with the result that the good all-round physician is in danger of becoming extinct. Now, I hold that no man can become a great physician who is not a good all-round man; instead of limiting himself to a single line of work he should, as far as is possible in the span of one short human life, aim at being that paradox, a universal specialist, taking up his position, as it were, upon an eminence whence his eye may sweep the entire pathological horizon, and not resting content with the circumscribed outlook to which the specialist, as we know him, is but too prone to limit himself.

The practitioner has little cause to welcome the growing tendency to specialism; he is constantly being asked to call in a specialist, and patients are constantly going off to consult one on their own account, for there is an ever-growing craze for specialism of every description. We are naïvely asked who is a good man for "kidney disease in a child," "pain in the back in an old woman," "eczema

* The term "general practitioner" is usually employed in contradistinction to such terms as "specialist" or "consultant." In this work, for the sake of brevity, I omit the qualifying term "general," employing the single word "practitioner," although, strictly speaking, every one who practises is a practitioner. The term "generalist" would be more accurate.

of the ear in a young man." Be it observed, however, that the practitioner is himself largely to blame for this state of things, the demand for specialism being in no small measure due to his own inability to cope successfully with special diseases. Let him but acquire skill in their treatment, and he will secure and retain many patients who now find their way to the specialist. Wherefore I counsel the student at hospital to spend all the time he can in the special departments.

Within recent years special methods of clinical investigation have been devised, for which laboratories have been equipped in our general hospitals and elsewhere. The blood, sputum, urine, dejecta, contents of the stomach, etc., are examined chemically and microscopically, and the science of bacteriology has been brought to the practical aid of the physician. These methods are of undoubted value, but we must not suppose that great skill in this branch of work is needful to the making of a good physician. We may ascertain by special methods the daily variations in the acidity of the urine; in the quantity of urea, uric acid, and other urinary ingredients; and in the amount of hæmoglobin and the number of red blood-corpuscles in the blood; but all this takes time, and no man in extensive practice can give it. While, therefore, I would not dissuade those who have special aptitude for this kind of work from indulging their taste within limits, I do not advise the average student to devote himself to it, as in practice he can get it better done by experts than he is likely to be able to do it himself. As a matter of fact, the man who spends much time in laboratory work seldom makes a good physician. His clinical acumen, which can only be adequately developed by constant association with disease at the bed-

side, by observation of the living human, does not seem to develop properly. In the laboratory he is introduced to a different kind of study altogether, and one that often appears to have a detrimental influence on him. For the laboratory type of physician, like the symptomatologist already referred to, runs, I have observed, great danger of mistaking the means for the end, and of deluding himself with the belief that he is actually benefiting his patient by subjecting him to an elaborate system of chemico-physical investigation.

Here a word may be said on the subject of clinical teaching. All will agree that clinical surgery is well taught, but the like cannot, I fear, be said of clinical medicine. In spite of the learning and skill of our physicians, few of them are experts in the art of imparting that knowledge and that skill, for, unhappily, the possession of knowledge and the ability to impart it are very different things.

This dearth of good clinical teachers is mainly owing to the fact that in the election of physicians to teaching hospitals due regard is not had to their teaching capacities. This is as mistaken in policy as it is wrong in principle. The ability to teach is a far more necessary qualification in the member of the staff of a teaching hospital than is a brilliant academic career. On him devolves, as member of the staff, a double duty—not only the exercise of his craft, but the teaching others how to exercise it, and in proportion as he succeeds in these must his election be deemed to have been wise. To suppose that his teaching duties are merely accessory to his duty as physician is to form an altogether wrong conception of his position. He is under a grave obligation to do his best not only by his patients but also by his pupils, and by arming these with the means by which

they in their turn may do successful battle against disease, to extend the benefits he confers on humanity far beyond the narrow confines of his hospital.

Under the present system of election it is impossible to be certain of securing the best clinical teachers, inasmuch as little or no opportunity is afforded the young physician, prior to his election, of demonstrating his teaching capability, and once elected he remains on the staff till age, death, or inclination removes him from the scene, mounting the ladder of promotion on the very simple, but most pernicious, principle of seniority. No concern run on these lines—medical, commercial, or any other—can achieve its full measure of success. In each and all, and always, every facility should be given to the right men to come to the front. "Catch your capable man," as Huxley tersely puts it; this should be the guiding principle in every department of human activity. The system of permanent election not only exposes the schools to the danger of being saddled with inefficients, but makes no provision against men "going off" prematurely; yet it is a strange and unhappy fact that, just as some women lose their beauty after the first blush of youth, so do some men who start with every apparent prospect of brilliant success somehow or other soon begin to lag behind, and finally drop out of the ranks of serious competition: they cease to develop, enthusiasm and initiative wane, the plastic cerebral protoplasm hardens all too soon, and the brilliant, forceful man of yesterday becomes the stolid, uninspired, platitudinous bore of to-day. He has failed to realize the expectations formed of him and is no longer fit for the position he holds. We are all sorry for him, but our sympathy must be tempered by our sense of duty to others, and not blind us to the facts that he is no longer the right

man in the right place, and that by allowing him to continue in it we are doing a grievous wrong not to one but to many; for through the students it must react upon a large section of the community.

THE POST-GRADUATE EDUCATION OF THE PHYSICIAN.

The Consultant.—The young physician who contemplates the career of a consultant should ponder well before entering upon it. Let him remember that the financial prospects of such a career are anything but brilliant, and that only the specially gifted, and those endowed with great staying power, are likely ever to derive a large income from consultation work. For the fact is that there is not enough consulting practice to go round for more than a small number of even the full physicians to hospitals, let alone the assistant physicians. In London, for instance, there are nearly a hundred physicians and assistant physicians attached to the teaching hospitals alone; including other hospitals, their number amounts to something like two hundred.

This fact is beginning to be recognized, and most of the younger men, tempted by the more brilliant prospects held out by surgery—brilliant in respect of results achieved as well as of financial gain—are rushing into this branch, both general and special; while there is a dearth of applicants for posts as physicians, and thus grave danger of the best brains being diverted from medicine.

The consulting physician has often, indeed, to rest content with the dignity attaching to his calling, and the opportunity it affords him of grappling with interesting problems and advancing a noble science. Some, having other sources of income, ask for no more than this—nay, do not lay themselves out for practice; but it

is probable that most young physicians expect one day to repeat the worldly success of a Sir William Gull or a Sir Andrew Clark, and it is only by the slow process of time that they come to realize that their aspirations were foredoomed to failure. Let such take comfort in the reflection that success in our profession is not accurately gauged by income, and that one of the proudest traditions of British medicine is that, though recognizing that the labourer is worthy of his hire, it looks beyond the mere acquisition of wealth.

Unfortunately, the consulting physician nowadays generally specializes, if he does not actually *exclusivize*; he casts about for some one branch of medicine—often a limited one—of which to make a special or even exclusive study, and seeks, by reading papers at societies and in other ways, to get himself identified with it. A famous specialist in diseases of the skin once told a young man who contemplated taking up the same line, to get himself so completely identified with cutaneous disorders, that when anyone heard his name mentioned he would forthwith start scratching himself! The temptation to follow advice of this kind is great, for undoubtedly specialism opens the shortest road to practice, though even if he takes up a special subject, the consulting physician has to wait a long time for private patients.

To the surgeon-specialist (eye-surgeon, aurist, etc.) practice comes comparatively early; to the general surgeon also fairly soon; but to the physician, especially if he refuses to specialize, it comes late, if indeed it comes at all. Hence the strong temptation to drift with the stream, and some courage is needed to resist that temptation. Nevertheless, one would like to see more physicians make the attempt, and if the necessary ability and will power are there, success will come in the end and be all the

greater and more complete for the difficulties which have had to be surmounted.

But even when the consultant decides to take up a special line, he should still seek to make himself a good all-round man. Having served his term as house physician, he should work at the special hospitals, either as resident or clinical assistant, and should become expert with the ophthalmoscope, laryngoscope, and other instruments of the kind. Now is *par excellence* the time for him to profit by the ripe experience of older men. From them he may gain knowledge which it would otherwise take him years to acquire; wherefore he should attend the clinics of the leading physicians of the day, at home and, if possible, abroad. This plan is not sufficiently followed, and I am convinced that the consequent loss is enormous. I do not say a man should be a slavish follower of his elders; there is no doubt that he who is always a listener, and who does not think and strike out for himself, is apt to lack self-reliance and initiative; but, inasmuch as the budding consultant soon has out-patients, and, it may be, beds of his own, little danger is to be apprehended on this score.

Most consultants go through a period of teaching after qualification; all those who are connected with the medical schools necessarily do so, and the practice is a most salutary one. Thereby they consolidate and extend their knowledge, learn to formulate their ideas clearly, and accustom themselves to face a stiff cross-examination. Above all, they get to realize their ignorance, and to attack problems that would otherwise perhaps never occur to them. I speak from personal experience, for it was at one time my lot to prepare students for the professional examinations, and after several years' experience I was still constantly discovering my ignorance regarding

apparently the simplest things. A new light suddenly flashes upon the teacher while he is explaining something, or a question is put which shows what has hitherto seemed a self-evident fact to be a subtle problem demanding solution. Thus the mind of the teacher is constantly being stimulated and led into new paths.

Perhaps even more valuable than teaching is writing. Bacon says that reading makes a full man and writing an exact man. But writing does more than this; it makes, provided the right subjects are chosen, an original man, or perhaps it would be more correct to say it educes any originality there is in him. Let the physician choose as his theme not some barren, worn out topic, but one capable of being developed *a priori*, and I shall be surprised if he does not find ideas occurring to him which would never otherwise have entered his brain. We want original thought; the only way to get it is for men to think for themselves, and to this end they cannot do better than adopt the plan suggested. I do not say that the original effusions need be published; I am regarding them rather in the light of personal exercises; yet the writer would probably find some at least of them worthy of being presented to the world.

It is, of course, necessary for the consultant to become attached to a general hospital, for before he can be a good physician it is imperative that he shall for several years have charge in the hospital of both out- and in-patients. It is not enough that he shall have a large experience of either the one or the other—he needs it of both. One who has worked much among out-patients but done little work in the wards, will probably be good in the one sphere and only indifferently good in the other; and *vice versa*. In the out-patient department he learns to discriminate between the slighter and the more serious

cases of illness, and becomes swift and sure in diagnosis; in the wards he is able to follow the progress of disease, and to study its symptomatology from day to day. To be thoroughly efficient he must have done both.

A physician should have not less than ten years' experience of out-patient work. If he attends hospital twice weekly, this will mean 1,000 visits, which, at the rate (and I fix it at a fair average) of twenty new patients at each visit, gives a total of 20,000 cases in the ten years—none too large a number to afford the necessary experience.

Suppose the physician to be promoted early from the out-patients to the wards—let us say five years after his appointment to the hospital: his want of experience in out-patient work will be felt throughout his career; and, contrariwise, if he has no chance of getting beds of his own until he is, say, well past forty, his chances of becoming a good clinical man are greatly jeopardized, for a man past the meridian of life rarely comes to a new study (and that is what it practically amounts to) with the freshness of his younger days.

The physician needs, I say, the double experience of in-patient and out-patient work. Only after many years' experience of each is he able to get that practical insight into disease which enables him to form sound opinions—often almost intuitively and without pause to say why, and to gain that knowledge which cannot be got from books, which is, in fact, incommunicable, yet which is the very essence of the equipment of him whom we term a "great" physician. It would be well, therefore, if an arrangement could be made by which every physician to a general hospital should n arge of a fair a minimum number of years v ten patient department, but sh

number of beds from the very beginning of his appointment.

The Practitioner.—The newly-qualified man destined for general practice should at any cost secure a resident appointment at a general hospital, where he should devote as much time as possible to the special departments. After this he should work at special hospitals. This done, he may attach himself for a short period, and only a short period, as surgeon to a ship, or obtain a travelling appointment; and finally, before settling down, he should for awhile act as assistant, for this is the best way to learn the working of a general practice. In this capacity he will derive many valuable hints on treatment from his senior. But when settled down in a practice of his own let him never forget that he must still remain a student if he is to keep his knowledge fresh and up to date. This is done by reading, by joining post-graduate courses, and by attending meetings of medical societies. In London and other large cities special facilities are now offered for post-graduate study, so that it is easy, for one who wishes, to keep in close touch with advancing knowledge.

But here comes in the question, What is the newly launched practitioner to read? how order his reading? So much is written, and our time is so short. "Systems" and "dictionaries" of medicine let him eschew, except for occasional reference; they will help him little, and he will usually find that he has to wade through a mass of irrelevant matter before he finds, if he finds at all, that for which he is seeking; moreover the waste of time is irritating as well as serious. For systematic study let him rely on the standard textbooks and on the sound [illegible] which abound on every subject. The [illegible]cal journals he must glance through re-

gularly if he is to keep in touch with the passing interests of the profession and the latest thought in it. Perhaps to do all this may seem to make too large a demand upon the very limited leisure of those in extensive practice; but it must be remembered that a man's best reading days come *before* he has the extensive practice, in the time of waiting and preparation for it; and, if he spends some hours daily during that time of probation in mastering the best that has been thought and written on the subjects connected with his life's work, even a scanty leisure will in future serve to keep him abreast of current medical literature.

But when all is said and done, it is not a knowledge of medical literature that makes the good physician. If we seek to *know medicine* we must go to the book of Nature, and study disease and the modes of grappling with it in the living subject.

* * * * *

Before concluding these inadequate remarks on the subject of medical education I would insist upon the great importance to the physician of preserving throughout his career a receptive attitude of mind, and of combating with all his strength the fatal tendency to become stereotyped.

I have already alluded to the fact that, as with others, so with the physician, age does not always fulfil the promises of youth. When it does not, we generally find a tendency for the mind to become stereotyped, to cling to old habits of thought, and to resist the influx of ideas which in any way conflict with these. This tendency is partly temperamental—due to a disinclination to part with a cherished belief, whether from obstinacy, intellectual inertia, or what not; or it may result from premature senility, for it is an unhappy fact that some

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men, almost before they seem to have reached maturity, stiffen in their minds as in their joints, and while they begin to walk with rigid spine, show by unmistakable signs that the insidious process of senility has already begun to produce a similar rigidity of mind.

Against this great danger of becoming stereotyped the physician must, I say, jealously guard himself; he must endeavour to keep his mind—as also his body—supple and plastic, and be ready at a moment's notice to abandon his most cherished convictions if so be they are proved not to square with facts, and this no matter how disturbing may be the process to old habits of thought, nor how laborious a rearrangement of ideas it may compel. Wrong convictions, like out-of-date guns, are a source of danger, and must be relegated to the mental scrap-heap with all possible speed. Our transatlantic cousins have taught us that it is the truest economy to break up the most costly plant, even though but recently laid down, if it can be superseded by anything more efficient.

But while cultivating a receptive attitude of mind, we must beware of running into the opposite error of indiscriminately embracing every new idea without carefully weighing the evidence for and against it. To preserve an open mind—that is the true scientific spirit. A rooted antipathy to new ideas, that inaccessibility, or imperviousness, to them which Matthew Arnold christened "Philistinism," will trammel and render ineffective an otherwise powerful intellect. There was a surgeon of eminence who long resisted the teachings of Lister, and was wont to make merry at his classes over the precautions which Lister took against the dreaded pyæmia, thereby provoking—much to his own satisfaction, no doubt—many a laugh from the callow students. But

the time came when the laugh was turned against him. He began to find his practice falling off, while most brilliant results were being obtained by antiseptic methods all over the world, and finally realizing his mistake, in a crowded theatre he formally accepted Listerism. But his recantation came too late: when he emerged from his mental prison-house it was to find that surgery had no longer need of him.

CHAPTER II

THE PHYSICIAN'S PHYSICAL PERSONALITY

HERBERT SPENCER has said, "The first requisite to success in life is to be a good animal," and to no one is the remark more applicable than to the physician. To consultant and to practitioner alike, health and a good constitution are first essentials. In saying this I do not ignore the fact that there have been highly distinguished members of the profession who have successfully struggled against physical disabilities: that simply means that their force of character enabled them to overcome all obstacles; but it must have been at the cost of immense and constant strain, relieved from which their achievements might have been greater still, and my contention that sound bodily health is a first desideratum to success holds good notwithstanding them. One has only to look at the day's work of a London hospital physician to realize this. First, there are his private patients, each making demands upon him by no means represented by the prescription carried away, for they are demands not only on his professional knowledge and acumen, but upon his human sympathies, his tact, his *savoir-faire*, his animal spirits—in a word, upon his whole personality. Then there is his original work—investiga-

tions, writing, perhaps both, his hospital work, his clinical or other teaching, his reading and research; and over and above all these, there are the calls made upon him as a member of the great social organism, as "a citizen of the world." And similarly with the busy practitioner, who, if he is in some respects under less pressure than his consultant brother, has other taxes upon his strength, not the least being the liability to constant interruption at all hours of the day and night.

In short, the medical man needs to be endowed with an iron constitution. Many a man starting life with high ambitions has had to fall out by the way through sheer physical inability to bear the strain, and the men who come to the front owe their success not a little to their superior staying power—to the fact of their being Spencer's "good animal." It is a truism to say that the best-fed brain and the most vigorous nervous system must win the race, other things being equal.

Health and strength have other advantages than the staying power they confer. There is a strange contagion about them and the buoyant spirits that go with them, which may be very helpful to the patient. It is a common thing to hear it said: "I felt better directly Dr. X came to see me; he seems so full of life; his brightness and geniality stimulated me like wine." The physician with poor physique and feeble vitality is not likely to have this effect; of such I have heard the opposite kind of remark, as thus: "I consulted Dr. Z, and he laid down for me certain rules which he said he had himself followed with great benefit; but I confess that I am not by any means enthusiastic as to the result, for he is but a very poor specimen of humanity."

But there is another and more weighty reason why

sound health is one of the most valuable assets of the physician: the brain works best when the body is healthiest. It is then that a man is able to give his patients of his best, that he sees clearest, judges most rapidly and accurately, that he is most painstaking and patient, most hopeful and convincing. How can he be all these things if he is not feeling well—if he is suffering, say, from an attack of megrim, or is depressed in spirits, or worn out and exhausted? How, above all, can he display that lively, ready interest in every case that comes before him which is essential if he is to do the best by it? Not a few of us can testify how difficult it is, in a crowded out-patient room, to throw oneself with the same zest into the cases that come late as into the earlier ones; and after spending two or three hours standing in the wards (when the vasomotor mechanism which antagonizes the effect of gravity on the circulation begins to give out, and the blood accumulates in the lower part of the body), how next to impossible it is to tackle a fresh case, more especially if it be a difficult one, with the proper zeal. This is one reason why it is often inadvisable for a doctor to make his rounds on foot: he is apt to tire himself out by walking, and he cannot, when tired, do himself or his patient full justice.

We are careful to give our judges short hours of work and to allow them long holidays, though some years ago there was an outcry against the practice. It was argued that, inasmuch as their emoluments are very large, they should work for longer hours and be content with a yearly vacation of a few weeks, instead of one of three or four months. But the wiser among us knew that in order to secure the best judgments it is needful not only to get the best brains, but to keep those brains in the best working order, and that we should not be doing this if we overtaxed

them. And what applies to the judge applies also to the physician. He is constantly called upon to grapple with problems as subtle and as difficult as ever confronted judge on bench, and in order that he may do it successfully he must keep himself in vigorous mental form.

The men who carry off the world's prizes are those who maintain a high level of mental health—who are, so to speak, always at their best. There are many who have their occasional good moments, periods of special effectiveness and even brilliancy, followed, however, by periods when vision is less acute and judgment less penetrating; and it is by these, their uninspired moments, that in the end the world estimates them, for the strength of the chain is that of its weakest, not its strongest link. I know a highly successful man of business who tells me he never undertakes a big deal requiring exceptionally keen judgment when his liver is out of order—that he dare not trust his judgment then. Doubtless it is in great measure because he has realized this, and has acted upon the knowledge, that he has been so successful; there are many similarly circumstanced who do not realize this truth, and who in consequence fail where he has succeeded. It is, I repeat, the man who is always at his best—who, like Napoleon's best general, makes the fewest mistakes—that is the most successful. The successful physician must always be inspired.

It is not sufficiently recognized how much mental efficiency depends upon bodily efficiency, and how greatly, therefore, it fluctuates from day to day. For while we have trustworthy means of testing such daily variations in dexterity and skill as are known to be largely influenced by the state of a person's health, we have no ready means of accurately testing variations in purely mental efficiency. How common it is to hear a man say

he is "not in form to-day"—that he can't shoot, or play billiards or golf; and so well does the sportsman know that he is not at his best when his liver is out of order, that it is a common practice for him to take a liver pill the night before a big shoot. All this is recognized, but that mental efficiency is equally dependent upon the bodily health is not so generally accepted, for we have no similar test to drive the fact forcibly home.

CHAPTER III

THE PHYSICIAN'S MENTAL PERSONALITY

I HAVE already somewhat encroached upon the subject of the present chapter in dealing with the influence of the body upon the mind. Dismissing this aspect of the question, therefore, I now turn to the consideration of the physician's mental personality in a general way, and under "mental personality" I include the entire mental equipment of the physician other than the strictly technical knowledge he gathers at hospital and from reading. Such knowledge forms but a part of his mental stock-in-trade. Other qualifications are needed if he is to be a successful practitioner. Thus he must be business-like; he must have a knowledge of men and things; he must be authoritative, so that he may enforce his orders; he must impress his patients with his ability, so that his words shall carry conviction; he must be able to inspire hope where hope is failing; and he must be tactful; he must have the kindly personal manner that makes a patient feel his case is of special interest, not a mere item in the day's work; he must, moreover, know how to create some sort of interest, and even enthusiasm, in the patient for the treatment prescribed: it is no small gain when we have made our patient *work with us* in the

cure of his complaint. Last, but not least, he must be duly endowed with sympathy and geniality. When that great physician, Sir William Gull, was asked what he considered the two most important qualifications of the physician, he, to the surprise of the questioner, who not unnaturally expected him to place first a profound knowledge of the science of medicine, selected these two.

BUSINESS-LIKE HABITS.

In order that the physician may be a practical success he must learn to be business-like, or, perhaps it would be more correct to say, to apply his scientific methods in his daily routine. People are apt to think that science and business are incompatible, that the scientific man is too much absorbed in scientific theories and speculation to concern himself with the practical details of life —surely an entirely erroneous view, for inasmuch as the study of science tends to promote—nay, demands— method and precision of thought, it must tend also to a man's efficiency in affairs when he turns his mind to these.* A habit of mind once acquired abides. He who has learned to look on all sides—to probe, sift, observe the minutest details, compare, weigh, reject, give judgment— will not be at a loss when he applies himself to business. He will know that even in the minor affairs of life precision and accuracy tell. He will ask, indeed, if there be such things as minor affairs when trifles light as air

* Karl Pearson, in the introduction to his "Grammar of Science," emphasizes the educational value of science on this very ground, contending that "modern science, as training the mind in an exact and impartial analysis of facts, is an education specially fitted to promote sound citizenship," its value in practical life depending, *i.e.*, upon "the efficient training it provides in *method*." This is a powerful work and will repay careful study.

"make life," * are constantly turning the scale this way or that. Thus the physician, with his scientific habit of thought, will not neglect such apparently small matters as punctuality and promptitude. He will be scrupulously punctual: time is of value to others as well as to himself. And he will be prompt: delay may mean painful suspense. Even in the matter of answering letters he will allow no putting off. It is a simple rule, but to a busy man an invaluable one, that all letters be answered at once. Sometimes it may prove irksome, but in the end it saves trouble as well as mental disquiet. I may mention in this connexion that when, some years ago, I sent copies of a work I had just written to a number of prominent men, the very first acknowledgments I received, and these no mere formal ones, came from Sir James Paget and Sir Andrew Clark—two of the most busy, as they were certainly the most successful, members of our profession. These facts speak for themselves.

KNOWLEDGE OF THE WORLD—TACT.

The physician needs to be versed in many kinds of knowledge. Not only must he be well up in his professional work, but he must also understand something of men and things; he must be a man of the world in the sense that he must be in touch with the life around him, not wrapped up in learned theories and technicalities. To none is it more necessary to know "something of everything" as well as "everything of something." Knowledge of the world is to him almost as necessary as a knowledge of medicine. The physician who is merely learned in the learning of the schools, who refuses to

* "Think naught a trifle, though it small appear;
Small sands the mountain, moments make the year,
And trifles life."—YOUNG: *Satires*.

come out of his professional aloofness and study man in his wider relations, is indeed hardly worthy of the name, and is sure to prove a failure.

The most distinguished career at college will avail him nothing; he is bound to be outstripped by the men who, though greatly his inferiors in learning, have been spending the time that he has devoted to books and the more purely scientific aspect of his profession, in acquiring a greater knowledge of mankind and things in general. Nor have they made a mistake. This is no waste of time. It is education in the truest sense; the knowledge thus gained is effective knowledge, and belongs to the physician's assets quite as much as that which has gained him his degrees. And, indeed, I venture to think that of the two kinds of knowledge—the purely professional and the "human" knowledge, as we may call it—the latter is the more difficult to acquire and to apply. To display the necessary tact towards our patients; to be able to feel, and rightly to appreciate, a difficult situation; to say the right thing in the right way at the right time and in the right place; nicely to adapt one's conduct to multitudinous differing types of persons under constantly varying conditions—to be able to do all this surely demands a higher order of ability than that which enables a man to obtain academic distinctions? and when I hear it said of a physician who has achieved great success in practice that his knowledge of scientific medicine is limited, I reply that he is skilled in a species of knowledge more difficult of attainment than that which can be got from books, the lecture-hall, or the dead-house: he has learned to know men.

Were it only possible to test such knowledge by examination, some physicians of most modest academic qualifications would achieve brilliant distinction.

Let not, then, the student who in spite of honest effort has failed to carry off the prizes of the University, on this account underestimate his chances of ultimate success if he is well equipped in other respects. As a matter of fact, much of his examination work will be wholly useless to him in practice.

INSPIRING CONFIDENCE.

Above all things, the physician must be able to inspire his patients with confidence. However learned, he will not be a success if he fails in this particular. I have known a lady—a woman of average sense—consult a most capable physician, and directly she has entered his room make up her mind that he can do her no good; then go to a man much less able professionally, and place implicit faith in him at once. What has made the difference in her estimate of the two men, and to the disadvantage of the better one? This is surely worth our consideration.

How is the physician to inspire confidence?

Self-Confidence.—First, he must have confidence in himself. There is an old saying, and it does not need a long life to learn its truth, that the world estimates us at our own valuation. The highly confident man infects others with his belief in himself. Self-confidence is to a large extent temperamental, and, like geniality and other mental attributes, varies with the health: we are most self-confident when we are most exuberantly well, and thus by cultivating health we cultivate also self-confidence. But the best way to gain it is by the mastery of our work. This gives a sense of power, and the confidence thus begotten shows in the whole man in divers subtle and unconscious ways.

Impressiveness.—Apart altogether, however, from this well-grounded, this justifiable self-confidence, there is something in the personality of certain men which helps to impress, and which, for want of a better word, we will call "impressiveness." It is a quality too impalpable to be defined: a mere trick of manner, a glance, a tone of voice perhaps, all go to make it up; yet that it is by no means a negligible quantity, examples like that just given go to prove. It is the chief capital of the charlatan, and though I should be very far from holding up that species as an example, there are few from whom something cannot be learned, and it is as well we should not, by neglect of what we perhaps regard as trifles, give the impostor an advantage over those who have the actual qualifications of which he has only the specious pretence.

"Manners maketh man," and it is curious what very small things often go to the attaining of results. Thus, the care that a physician *is seen* to bestow on the examination of a case; the interest he appears to take in it; his consistency; his authoritativeness; the environment which he chooses for himself, *e.g.*, the style and appearance he keeps up—are all factors in the impression he makes.

It will be observed that I have italicized the words "is seen" in the foregoing paragraph, because it is not always enough to *bestow* care. I have known doctors actually injure themselves in their patients' regard by their quickness of diagnosis and ready grasp of the situation. The patient, knowing nothing of the mental processes by which the judgment has been arrived at, is apt to doubt if his case (in his own eyes generally unique, and always of gravest importance) has been duly considered, and to feel aggrieved in consequence. Having

no Conan Doyle to demonstrate how invariably right our deductive acumen leads us, it is not well to be too much of a Sherlock Holmes!

Although it is impossible to lay down any rules for the acquirement of anything so elusive and so purely a personal attribute as "presence" or "impressiveness," I am tempted to give a few hints indicating in what directions self-restraint and watchfulness of ourselves may help towards that end. Thus the physician should scrutinize his patient carefully; he should be a good listener; his own talk should be incisive, deliberate, and to the point; he should not repeat himself; and he should avoid all fussiness, and (is it necessary to add?) all pomposity. Especially should he know when to be silent, for for him more than for most men silence is often golden. Occasions are constantly arising when garrulity, or a too premature expression of opinion, may seriously involve him; rarely, if ever, will reticence cause him embarrassment. I have heard of a doctor of little real ability actually acquiring a high reputation by dint of always remaining silent when in a difficulty. And though I would not be misunderstood here (for I am by no means advocating silence as a cloak for inefficiency), yet it is well for us all to remember that the silent man does not give himself away, a danger the naturally expansive are at all times running into. A little self-repression undoubtedly aids us in a patient's estimation. No one knows what is passing in the brain of the silent man, and the patient—already, we may believe, predisposed to rely upon the sagacity of the physician of his choice—is inclined to attribute want of words to profundity of thought. Though we may smile at his simplicity, it is not for us to undeceive him, since it is through his confidence in us that we hope to do him good.

Interest Shown in the Patient.—Careful examination of the patient exercises, I have said, a valuable psychic influence. He expects it, he likes it, he is impressed by it; moreover, it helps to make him feel we are interested in his case. Man, naturally egotistic, becomes still more so when he is ill, especially if he is gravely ill, or thinks that he is. His illness is to him for the time the one great fact of the universe, and what more natural than that he should expect "his physician" (note the *his*, for it is significant) to regard it similarly? Some physicians have the gift—a rare and valuable gift it is, I had almost calledit "genius"—of being able to make each patient feel that *he* is the one uppermost in their thoughts, the occasion of their chief solicitude, and thus they win his confidence and satisfy his egotism at one and the same time. But it is a gift that has its dangers; it needs the accompaniment of a good memory, or the possessor may suddenly find himself cast down from the high pedestal to which perhaps, without his knowing it, he has been raised. Take a case in illustration. We have all probably known of such incidents. A lady consults a physician; he enters minutely into her symptoms, even shows, as she believes, an eager interest in them, and prescribes a course of treatment; she goes away delighted, and is loud in his praise—"He is so clever, and thorough, and *so* sympathetic, you know." Imagine the rude awaking when she calls again a short time after with a friend, and the clever, sympathetic doctor, failing to recognize her, blandly asks which is the patient! Or take another case. A gouty old gentleman, inflated with the sense of his own importance and accustomed to tyrannize over a submissive household, finds the physician, whom he has done the honour to consult on several occasions, has actually forgotten all about his

case. The blow to his *amour propre* is not easily forgiven. Now, occurrences like these, petty as they seem, and as indeed they are, give great offence. They can only be avoided by making careful records of each case (merely noting, of course, the salient features), and refreshing the memory by a reference to them when a patient's name is announced. This practice was invariably followed by a late eminent physician who surprised and delighted his patients by his detailed knowledge of their cases. "What a wonderful memory he must have, and how interested he must have been in my case!" was the thought of each.

Consistency.—The next point to be considered is our consistency in what we tell our patients. If we are to impress them favourably, it will not do to contradict to-day what we said yesterday. At first glance this danger may seem easy to avoid, yet most physicians will bear me out when I say that it is by no means easy, in face of the multitudinous little points of detail on which our directions are asked, always to give the same reply. When the questions referred to are matters of moment there is no difficulty, but seeing that often enough they might be answered just as well one way as another, it requires a good memory if we are not to be caught in a discrepancy, and a good supply of mother-wit to help us out of the dilemma if we are.

But it is not only in self-contradictions that we may be involved, nor which give us the most trouble. We may be confronted with a contradiction between our own advice and that of another physician previously consulted. Of course we always act loyally by that other physician, but in the endeavour our resources may be severely taxed. Or, again, if we are acting conjointly with another physician, we may find it most difficult to

reconcile opposing statements. On one occasion another doctor and I were jointly looking after a patient who had consulted physicians all over the world, and had had great experience of many kinds of treatment. Now, this man took a malicious delight in trying to get us to contradict each other, and on one occasion he put me through a searching examination about his food—might he eat this, might he eat that? Conscious of his aim, I felt my way with great caution, and he seemed disappointed at my replies until at last he asked if he might take pork, and when I said *no*, his face literally beamed with delight as he triumphantly produced a long, typewritten list of the things he might eat, given him by my colleague before I was called in—and pork was one of them!

An instance such as this is perhaps chiefly amusing, but when we come to the different treatments advised by different doctors for the same disease, the antagonism of opinions is somewhat painful to contemplate. It expresses in a most striking way the confused state of present-day therapeutics, and in no department does this come out more strongly than in dietetics. Let a patient consult half a dozen physicians in succession regarding his diet, and the chances are ten to one that no two will be agreed.

Authoritativeness. — Authoritativeness is another trait absolutely essential to the physician. Our authority must be supreme, whether our patient be prince or beggar; we must have absolute control, for our directions must be implicitly followed. The patient must never be allowed to get the upper hand, or to question our fiat; and to secure that he shall not, we must be authoritative, sometimes even peremptory. And here we have to be careful that our authority is not under-

mined by officious friends, nor yet by the nurse. I regret to have to say that the nurse is often a serious offender in this respect, criticizing the treatment prescribed because it is not "what Dr. So-and-so's would be," and so forth. I suppose nurses are taught during their training that such criticism is a grave offence, but from my experience its gravity is hardly sufficiently insisted upon; it should be enforced as a golden rule, and made a point of honour with them, that they make no comments of this kind. As things are, the doctor has to be on his guard against what is an irritating menace to his influence, and he should, as far as possible, employ nurses whose loyalty he can rely on.

The Physician's Personal Environment.—If the physician is to impress his patient well, he must have due regard to his own personal surroundings. Last in order, it is also least in importance, but it is a matter we cannot afford to despise, well though we know that a man's merit rests in himself, and not in his house, his horses, his carriages, or his servants. These are mere trappings, not the true measure of the man. But we must take the world as we find it, and the world judges—perhaps necessarily—of a man's ability largely by his worldly success. If he lives in a meanly-appointed house in an obscure street it argues that he has a poor practice and therefore in all probability poor ability.

The following incident will point this remark. A doctor practising in a London suburb once asked me to coach him for an M.D. degree. He said: "I have a friend who is a consulting physician in Harley Street, and during his holiday last year I saw his patients for him. I was immensely struck by the awe with which they entered my presence and the readiness with which they laid down their guineas, in startling contrast with the

behaviour of my own patients at home, who often grumble over my small fees, and are by no means always disposed to treat me with an excess of ceremony. Now I am persuaded that I can do my patients quite as much good as my friend, and I am going to take a leaf out of his book. I need a better setting to show myself off, and I propose to begin by securing the right to append the magic letters M.D. to my name."

Apropos of this social side, as we may call it, of the physician's life, I would utter the old warning that "familiarity breeds contempt." In general practice social intercourse with patients is in many cases unavoidable, but inasmuch as it may tend to undermine the authority of the physician and lessen his prestige, it should as a rule be shunned as far as possible.

Reputation.—A word on the reputation the physician has acquired, as an element in his success. To place success itself among the factors which contribute to that success may seem to be arguing in a circle. Yet there is a good deal of worldly wisdom crystallized in that very characteristic modern-day saying, "Nothing succeeds like success," and, in truth, the help the physician derives from having achieved a reputation is simply incalculable; once he has that, he is beyond criticism, and whatever he does is accepted outright. The greatest eccentricities are pardonable—nay, admirable, and to be expected. Instead of exciting criticism they served only to impress; for are not the ways of genius always eccentric?

It sometimes happens that a man acquires a reputation from quite accidental circumstances, personal merit having little to do with it, but such cases concern us not; it is not with the reputation thrust upon us but with the reputation achieved that we have to do here;

[redacted]

and I only mention this factor at all (since it is for the most part not within our control) because it is one that it is impossible altogether to ignore. We all know that "there is a tide in the affairs of men"; over that tide we have no control, but what we *can* do is to see to it that we shall be ready to take it at its flood when it sets towards us.

CHAPTER IV

THE PHYSICIAN'S MENTAL PERSONALITY (*continued*)

SYMPATHY.

To turn now to sympathy—feeling with. We sympathize with a person when we feel as he feels; if we do not experience a feeling we cannot sympathize with another in regard to it. It is not generally realized how enormously individuals differ in the nature and range of their feelings.* Yet it is because of these differences that men differ in temperament and disposition. Individuality depends essentially on the feelings. If all men felt exactly the same, differing only in thinking power, each man would seem to be mentally very like all other men.

These differences in feeling are shown alike in respect of the simplest sensations and of the most highly elaborated emotions. Take taste sensations, for instance: what is pleasant to some is disagreeable to others; and the like differences are observed in respect of visual, auditory, sexual, and other sensations. I would especially draw attention to the differences observable among individuals in regard to those groups of sensations

* See further on this subject the writer's paper on "The Feelings" (*Journal of Mental Science*, April, 1900), from which these observations are for the most part condensed.

which go to make up the feelings of physical well-being and ill-being. These have a special interest for the physician, whose chief life-work it is to induce the one and banish the other. This is, indeed, the final end of all human effort, did we but recognize it.

Well-feeling varies in character—that is to say, we do not always feel well in exactly the same way; and there are still more numerous varieties of unwell-feeling—we may feel ill in many different ways. But for convenience we may regard both well-feeling on the one hand, and unwell-feeling on the other, as always the same in nature, and differing only in degree. We may thus construct a scale representing the various degrees of each; in the centre we place the neutral or indifferent feelings, and pass thence upwards through ever-increasing heights of well-feeling, and downwards through ever-increasing depths of unwell-feeling.

Now, neglecting temporary variations, we may say that every individual has his own particular note of feeling in this scale. The habitual note of some is a sense of exuberant well-being; of others—quite a large number—indifferent neutrality; of others, again, unwell-being. The sense of exuberant well-being is most common in young people; it tends to diminish after adult life is reached, and is only exceptionally found in the aged. Very few, even during their physical prime, much less as they approach, or actually enter upon, the period of decay, have that intense joy in living which belongs to the young. How soon it departs depends upon various circumstances. It probably goes sooner in the civilized man than in the uncivilized; in the sedentary town-dweller than in the country-dweller leading an active outdoor life; in the poor than in the well-provided. In the poor of large towns it passes away

soonest of all, if indeed they can be said ever to feel it; and it may safely be asserted that the second and third generation of very poor town-bred people never feel exuberantly well in the whole course of their lives: their habitual note of feeling is one very low down in the scale. Further, this joy in living disappears in women earlier than in men; a large number of women lose it soon after they have reached womanhood, seldom feeling more than moderately well from this time till after fifty, which is past the age for exuberant well-feeling.

When a person gets blasé, it is not so much that he is surfeited with pleasure as that his keen sense of well-being has become blunted, for it is impossible to feel intensely well and blasé at one and the same time. The pessimists of this world are those whose habitual note is one of unwell-feeling, influenced by which they take a gloomy view of things in general; while the sanguine and the hopeful are those who look upon the world through the rose-coloured glasses of their own pleasurable sensations. A sense of exuberant well-being is, indeed, incompatible with painful emotions or painful thoughts.

It need scarcely be said that those who seldom feel thoroughly well are greatly handicapped in life's race, though it is a remarkable fact that people get accustomed to not feeling well.

Coming to the region of the emotions, we observe the same differences obtaining among individuals. To take a single instance. Few realize how profoundly individuals differ in regard to their æsthetic emotions: the ordinary person can no more enter into the feelings of the poet or the painter in his moments of inspiration than can a man born blind form an idea of colour or of light.

One of the results of this diversity in the feeling capacity is that it prevents people from properly understanding one another. To understand a person you must yourself be capable of feeling his feelings—*i.e.*, of sympathizing with him. Nine-tenths of the misunderstandings and frictions of our social life depend upon these differences in feeling capacity.

It will thus be seen that the wider a man's range of feeling, the wider will be his sympathies, and the deeper his insight into human nature. If he is limited in this respect, though his intellect be never so great, he must yet be out of touch with mankind at large, shut out from any real communication with them; for it is not intellect that makes us understand men, but feeling. This explains why so many unintellectual people have a quick insight into character—it comes to them through their feelings; and why some of the most intellectual cannot penetrate below the surface of individuality, their feeling capacity, which is the measure of their insight, being less developed than their intellectual.

Now, no man can make a great physician, in the true sense of the word, who has not a profound insight into human nature. He must seek to realize how his patients feel, and so get into some sort of touch with them. Failing in this, he will often fail in his diagnosis, and still more in his treatment. I am not here advocating any maudlin sympathy. As with the gold of the decorator so with sympathy, it must be employed with judgment and delicacy. I merely wish to utter a caution against the danger the physician runs of becoming a mere learned man who regards his patients as so many "cases," interesting or otherwise, instead of so many poor suffering mortals looking to him for help.

GENIALITY.

To have sympathy is not enough; the physician must have geniality also, that his sympathy may make itself felt—not a cold, repellent manner. Geniality is the expression and outcome of exuberant physical well-feeling, coupled with kindliness of heart and a sort of mental equipoise.

Now, these are matters of temperament and character; but we have to remember that character is very much determined by habit — has indeed been defined as "a bundle of habits," and we can cultivate the habit of geniality just as we can cultivate any other habit. Psychology teaches us that to simulate an emotion is to go far towards experiencing that emotion, and it is not therefore beside the mark to urge on the young physician some manifestation of kindly feeling. But he needs, of course, to be discriminating. Naturally he cannot be otherwise than grave at the bedside of a dying man; in other cases a cheery, genial manner may stimulate and encourage. An indiscriminating boisterousness is, needless to say, always to be deprecated.

Unfortunately there are many circumstances tending to make the physician overgrave both in thought and aspect. Every day he sees sorrow and suffering, and he gets attuned to these. Now he is anxiously pondering over a perplexing case; now he is at a death-bed; now his advice is sought regarding some step on which important issues depend. Moreover, the difficult problems he has to grapple with develop in him a reflective turn of mind. The surgeon's work, on the other hand, is chiefly practical: he comes, he sees, he conquers; and, again, he has the great mental relief of being able to *do* something himself—something depending chiefly on his

own skill. But between the coming and the going of the physician deep and anxious thought is often needed; he may have to travel through an intricate labyrinth of reasoning to get at the truth upon which he (and perhaps the surgeon too) shall act. Is there any wonder he should be a grave man?

Now, inasmuch as the physician tends by the very nature of his work to be grave, and inasmuch as too much gravity is bad both for himself and his patients, he must seek to counteract it. The country doctor does not run the same danger of becoming unduly serious as his brother in the large towns. He spends much of his time in the open air, in free contact with Nature, than which there is nothing more calculated to make him frank and genial; and cricket, hunting, fishing, shooting, and other country pursuits, with some one of which at least he is pretty sure to identify himself, furnish interests outside his profession which are invaluable as correctives to overseriousness. The town doctor has to seek distraction from his work in other ways, and though the best he can find will probably be less conducive to geniality than the soothing, invigorating influences of the country, find some sort of outside influence he must, if he is to keep in kindly sympathetic touch with his fellow-men. What form it shall take individual taste must decide.

Geniality implies good temper and the absence of irritability. Under no circumstances should the physician display irritability to a patient, no matter how much he may feel it. There may be occasions when it is fitting to express anger—righteous indignation, but irritability must play no part in it. Self-discipline is the great life-lesson we all have to learn, and in proportion as we succeed in learning it shall we achieve success. "Self-

reverence, self-knowledge, self-control—these three alone lead life to sovereign power." The wise man quickly realizes that to attain to any great success in life he must submit to restraints innumerable, and that Bacon's dictum, "We rule by obeying," applies as much in the moral as in the physical world. He can only mount the ladder of success by skilfully adapting himself to circumstances, by showing, that is to say, a readiness to submit to certain restraints, moral and other. These restraints become increasingly exacting, the demands on his capacity to obey greater and greater, the higher he mounts and the wider grows his sphere of influence. Hence it is that he truly "rules by obeying." The deluded being who resents authority, who holds distorted views on the subject of liberty and equality, and who is too small-minded to acknowledge a "master," is, all unknown to himself, in a state of abject bondage, in the iron grip of a narrow, ignorant, and short-sighted self-esteem. We hear a lot of nonsense about liberty; no word has ever been more abused. Every one should have liberty to do right, but as little liberty as may be to do wrong; and by "wrong" I mean not only what the law regards as wrong, but whatever is detrimental to the best interests of the individual and of the community of which he forms part. In so far as he has liberty to do what is bad for him, he is placed at a disadvantage, and in so far as he abuses that liberty and refuses to obey the moral law he is, as philosophers have long insisted, a slave rather than a free man.*

* Writing on "The Physical Training of Young People," Dr. R. W. Felkin observes: "Prompt obedience is a necessity, not only from the moral, but also from the medical point of view. We are producing in this country at the present day a race of self-willed, self-centred, self-conceited young people, devoid of respect for God,

I do not apologize for pressing these points upon my younger confrères, for they may not realize how often they could with advantage urge them upon their patients.

But to return to the subject of irritability. We must never forget that patients who are ill are not to be judged by ordinary standards; we must be ready to judge them in a kindly spirit, and not be too quick to take offence. Often that conduct in a patient which is found so trying is purely the result of his illness—as much a part of its symptomatology as any of its recognized symptoms. A due recognition of this will save much ruffling of spirit. I remember an inexperienced medical resident once com-

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or man, or devil. All medical men must know this and the obvious consequences, and should raise up their voices against it. Obedience and self-restraint are prime factors in any healthy existence, and the sooner they are learnt the easier will they become."

The lack of self-restraint, of the habit of subjugating one's own impulses, here referred to, shows itself in nothing more objectionably than in the bad manners of the rising generation. There is much diversity of opinion just now on the question of religious instruction in the elementary schools, but however views may differ on this subject, there should be no two opinions as to the desirability of teaching school-children the rudiments of politeness. Implying, as it does, the larger habit of obedience, of constantly recognizing the supremacy of law and bringing our actions into harmony with law, the inculcation of it is of high educational value. It is a branch, and a very important branch, of morality, the practice of it adding to the pleasantness of human intercourse and making for better citizenship. The spirit of "I'm as good as you" causes the ignorant to believe that politeness between man and man is a recognition of inequality. They should be taught that, on the contrary, a man's own self-respect exacts it in his dealings with other men, and that politeness and independence of spirit are by no means incompatible; that courtesy does not imply obsequiousness; and that no sensible man demands from another more of it than he is prepared—nay, anxious—himself to show.

plaining to me that an old man with pneumonia had obstinately resisted the application of a poultice to his chest, and had threatened to throw it across the ward. The resident, a stern disciplinarian, was all for sending this terrible old sinner out of the hospital, and was greatly surprised when I said: "But, my dear X, can't you see the man is dying?" Another similar case comes to my mind. A nurse doing night duty was much irritated by a patient who would not, or could not, lie quiet in bed, but ever and again moved about and groaned, and at last she sharply reprimanded him, giving him something perilously like a shake. In the morning, when she went to see how he was, she found him dead.

HUMBUG.

I have discussed at some length the importance of impressing the patient, and this leads me to refer briefly, and it shall be very briefly, to the subject of what, for want of a better word, I must call "humbug." How far is the physician justified in resorting to the expedient of humbug? The young aspirant to fame repudiates the very suggestion; he will have none of it. Cost what it may, he will be straight, sincere; and the resolve is worthy of him and of his profession; for that he cannot have too high an ideal, and let him always keep it. But when it comes to the practical working out of what as yet are only his theories, he will at times, if I do not greatly err and unless he is singularly fortunate, have to fall back on evasions, subterfuges, prevarications, or, at the best, suppression of the truth or part of the truth, if he would not work greater harm than he will be prepared to face.

It may go against the grain — no doubt it will go

against it, for we all not unnaturally pride ourselves on our uncompromising veracity—but he is bound to find exigencies continually confronting him which will demand this sacrifice from him, and he will never be a great physician if he shrinks from making it. His standard of right here must be his patient's good, not his own. To take a common enough case in illustration: A woman and her child are dangerously ill, the woman in such a serious condition that mental shock would almost certainly kill her; are we, if the child suddenly becomes worse and she asks us point blank how it is getting on, to tell her the naked truth, or are we to keep from her the knowledge that might kill? This is not the place to go deeply into a question of ethics, and we are all familiar with the time-honoured arguments on points of the kind, but I would put such a case before the severe moralist ready to condemn any deviation from the strict truth as a truckling to expediency. Even he would hesitate here, I think, to carry his principles to their extreme. But we will take another instance. We may be in some doubt as to the prognosis of a case, and it may be just one of those in which, if we can only get the patient convinced that he is going to get well, he will actually do so. All we certainly know, however, is that the chances appear fair. Are we, then, to sacrifice his best chance of recovery by a blind adhesion to what we believe (though we have no proof) to be the exact truth, doling out so much hope and no more lest we overstep the boundary between truth and untruth? Personally, I should not hesitate to declare myself much more emphatically and hopefully as to the ultimate issue than I should if I were writing a treatise on the case and seeking after scientific accuracy. The unveracity, the disingenuousness, is justified by our patient's need. Our first duty is to him.

And here we get a clue as to what is legitimate, justifiable humbug, and we may even lay down something like a rule regarding it. Humbug is only justifiable *when it is in the interest of the patient;* at any time it entails a sacrifice, to a certain extent, of his strict personal integrity on the part of the physician, who most certainly would not choose to be anything but straightforward; and he is only justified in making that sacrifice if he believes grave issues depend upon it. For anything less, humbug is most strongly to be deprecated and scrupulously avoided, even when it happens to be in itself harmless enough; if practised from motives of self-interest it is criminal, and he who stoops to it from these is either a charlatan or a knave, perhaps both.

To give an instance of the kind of humbug I have in my mind when I speak of "harmless humbug," I will repeat an oft-told story. A famous physician of a bygone generation was called in to see a distinguished patient, and just after he had left him the patient dispatched a servant to ask if he might eat some grapes; the physician pondered a moment, and then gravely replied that he might eat ten—not eleven or twelve, mark you, but exactly ten—without the skins and pips. He then drove off, only to return, however, in a few minutes in order to give this very weighty direction—that the grapes should be white, not black! The story amuses us, and the little bit of play upon the patient's egotism has nothing in it very shocking to even the sternest of moralists; yet it is not quite admirable, it is hardly dignified, and certainly it will not stand our test—I believe a good practical test—that of usefulness to the patient.

Many of the injunctions given to patients in regard to dietary fall under this species of humbug, although

doubtless there is often no intent to resort to it. Under the head of charlatanry and knavery pure and simple I may cite such a case as the prescribing of bismuth for the purpose of darkening the motions, and thus getting the patient to think that bile is being got rid of.

Summing up my remarks on the mental personality of the physician, I would say that he needs above all things sympathy, geniality, and the power of inspiring confidence. These are his mainstay, but they must by no means complete the list of his attributes. There are no gifts of mind or manner which may not be made to subserve his work, for of no profession can it be more truly said than of his that it demands a man's best.

The mistake which I believe many, and these often very learned, physicians make is that they ignore, and even disdain, the personal side in their relations with their patients, thereby sinking to the level of mere machines for the delivery of *ex cathedra* judgments. We may call these "penny-in-the-slot" physicians. The patient puts in his penny, or rather his guineas, and out comes a cut-and-dried opinion. There is no real contact between the two human beings. But surely the physician should be something more than a machine? If we study the biographies of the greatest physicians of the past, or if it is our good-fortune to know some of those of the present day, we cannot fail to recognize how much the personality of the man, apart altogether from his scientific attainments, has to do with his success.

CHAPTER V

THE CO-OPERATION OF THE PATIENT

It is very necessary to get our patients not only to lend themselves to the treatment, but actively to co-operate with us in giving it effect. Sometimes patients come to us expecting to be made well without any effort on their part. To such it is necessary to point out that health is not something which can be had for little more than the asking, by swallowing, say, a bottle or two of medicine, or taking a pleasure trip; rather is it a great end to be achieved, a prize to be striven after. To be thoroughly well, have the full joy of life—is not this worth some inconvenience, some pains? Men are willing to undergo privation and sacrifice for financial gain, but of all forms of wealth health is assuredly the most precious, a treasure, indeed, which gold—although it may help to its attainment—cannot purchase. We must try to get our patients to see the matter in this light; we must explain to them, especially if the treatment is long and tedious, that they are not to regard themselves as mere passive recipients of a kind of magic cure, but rather as active participators in the work of their own salvation (Lat. *salvus*, in good health, whole, sound)—that they must set about the accomplishment of their cure in much the same spirit as they would undertake the learning of a language, or the mastering of a musical instrument. It

will also often be wise, in order to guard against disappointment and loss of confidence, to explain to a patient that he must not expect rapid improvement.

On the other hand, we may have to deal with the diametrically opposite class of patient—him, namely, who, far from taking no interest in his treatment, makes the pursuit of health the aim and goal of his existence. This eager greed, this unwholesome lust for health, defeats its own ends, leading as it does to constant self-examination and self-absorption, injurious alike to health of body and of mind, with the result that the unhappy victim drifts into a condition of chronic valetudinarianism of the worst kind, one which excites neither pity nor sympathy, but rather ridicule and contempt. Such patients need to be handled wisely and firmly. We must seek—though too often it will be in vain—to get them to realize how miserable, despicable, and suicidal is their unholy worship of self.

I have said that health is worth striving for. It is essential to ideal happiness. The true philosophy of happiness lies (so it seems to me) in the recognition that the basis of happiness must be health and some great, or at any rate absorbing, task which shall call forth the best that is in us. Man needs to realize himself, to feel his full faculties called out; until he does this he does not *live*, he is not happy, he vegetates. But mark well that it is the struggle to win, not the having won, that gives the real pleasure. Only through struggle, development, progress, can he be, as Browning puts it,

> "approved
> A man, for aye removed
> From the developed brute . . ."

and he is so constituted that his happiness lies in the struggle, not in the attainment, and well for him that it is so,

for the ideal ever removes itself further off. Some one has said that there is only one thing more disappointing than failure, and that is success; but the "high man with a great thing to pursue" does not say this. His goal is for ever receding, ever beyond his grasp, yet has he the joy of battle, of high endeavour, of faculties spurred to the utmost. And it is in this strenuous struggle, upheld by exuberant health and interspersed with moments of relaxation and recreation, that man finds his best happiness: such conditions are, in fact, but the fulfilment of Nature's intentions—to speak teleologically—regarding him. For even viewed from the biological standpoint alone, happiness is an accompaniment, an accessory, a side-issue of life, not its end. When we go in deliberate search of it, make it "our being's end and aim," it eludes us, it proves a will-o'-the-wisp luring us into quagmires of ennui and disappointment. It is more than sixty years ago now that Thomas Carlyle gave us as his gospel "Know thy work and do it," but no later philosopher has enunciated one to which we, as physicians, can so well give adherence. That way lie health and happiness, and we cannot point it out too often to our patients.

In saying that some patients expect to be made well without any effort of their own, I had in mind a class of persons who neither actively assist nor actively resist treatment, but who lend themselves passively to it if it involves no personal trouble. This indifferent class tails off on either side into two extremes. On the one side we have those who are actively hostile to treatment. They cannot take this, they cannot do that, and to each and every suggestion we put forward they oppose some kind of objection. Such, placing themselves as they do beyond the pale of our help, we had best leave severely alone.

Others, still more undesirable from our point of view, while not actively resisting our treatment, enter upon it half-heartedly, or in a captious, carping spirit, with an apparent determination not to get better. If they do benefit by the treatment, they refuse to acknowledge the fact even to themselves, much less to the doctor; or if the improvement is undeniable, they refuse to credit him with any share in it. Towards these grudging, lukewarm souls we have to exercise what patience and charity we can.

At the opposite extreme is the class of patients who lend themselves with alacrity and enthusiasm to the treatment, and display an extraordinary willingness to get well, so much so, indeed, that they may persuade themselves, and assure us, that they are much better when either no real improvement has occurred, or when, perhaps, they are even getting worse. I have known patients actually to cure themselves by such unconscious auto-suggestion, and in glowing terms (for patients of this class are usually prodigal of gratitude) credit the doctor with an achievement to which they might themselves more properly lay claim. All these personal idiosyncrasies present a wide field for the physician's tact and powers of influence.

CHAPTER VI

THOROUGHNESS IN EXAMINING THE PATIENT

It has been truthfully said that it is more needful for a physician to "take great pains than to have big brains," and though I am not one of those who believe the possession of genius detrimental to the medical man—for however it may be as regards a great surgeon, assuredly no man ever became a great physician in the true sense of the term without some touch of the Divine spark—yet it is certain that even genius will avail him little if he is not prepared to take infinite pains with his patients. Without doubt more mistakes in diagnosis and more failures in treatment arise through lack of pains than lack of brains. Every physician can furnish numerous instances of this. Quite recently I fell into a bad diagnostic blunder through an omission in my first examination. The case, which I saw in consultation, was that of a man of sixty, who was suffering from what then appeared to be double sciatica, but the occurrence of the pain in both legs, as well as the impossibility of referring it to any particular nerves, suggested to me that it might be due to an intrapelvic growth, and examination *per rectum* proved this to be the case. On first seeing him a few weeks earlier, however, when the

pain was in one leg only, and thus suggestive of ordinary sciatica, I had neglected to make the rectal examination, and thus missed the diagnosis. One other similar instance may be cited, though this time I, happily, was not to blame. I was asked to see a young woman suffering from severe headache. She was lying in bed in a somewhat drowsy condition. There had been vomiting; the pulse-pressure was slightly plus, the fundus normal. After examining the patient, the doctor and I drew up a list of all the possible causes of the pain, and then by a process of exclusion reduced them to two — namely, uræmia and meningitis. It now became necessary to know if there was albuminuria; but the urine had not been tested, and a specimen could not be obtained. I could therefore only give a provisional diagnosis; but the next day I received a note from the doctor saying that the patient was passing a large quantity of albumin. This was conclusive. It was evidently one of those somewhat rare cases, so apt to be overlooked, of small, pale kidneys, and the headache was part of the final uræmia.

To avoid errors of this kind we should always make a thorough examination of the patient, and, when possible, at the first consultation, for if not made then it is frequently never made at all. Unfortunately, we cannot always make the same complete examination when the patient comes to our consulting-room as when seen in bed (especially if the patient is a woman); and this is much to be regretted, for the point on which the case turns may quite possibly be overlooked merely from want of opportunity, not from any want of care. The light which a consultant throws upon a case is not infrequently due to the deliberateness and thoroughness of his examination. It is not surprising that, in the hurry

of busy general practice, the practitioner should sometimes be less thorough in his examination than the more leisured consultant. Here I would urge that in the case of the former, as well as of the latter, the fee for the initial examination of a case should as a matter of course be higher than that for subsequent consultations, owing to the greater demands it makes upon time and energy.

We shall best guard against overlooking anything of importance if we always carry out our physical examination according to a definite plan. Eyes, ears, nose, throat, chest, abdomen, should all be examined, if only cursorily, and the condition of the nervous system should be tested by means of the tendon-jerks, etc. Even if nothing abnormal is found, the time thus spent will not be wasted, for the moral effect on the patient of such a systematic examination may be considerable. He has doubtless strung himself up somewhat to take the, to him, important step of coming to a doctor, and he feels at least that his case has been thoroughly gone into. A practitioner once told me that he made a point of using all the "-scopes" whenever practicable, for even though his view of the fundus, drumhead, or vocal cords might not always be as satisfactory as he could wish, he had the gratification of impressing his patient with his thoroughness, and if the case ultimately came to a consultation, his methods of examination did not appear to disadvantage beside those of the consultant.

Our investigation is not, however, to be limited to an actual physical examination. We may want information which can only be communicated by the patient and his friends, and the need for painstaking investigation is as pressing here as in the physical examination. It is true that we may sometimes be able to make a diagnosis and

prescribe a course of treatment without putting a single question; but, on the other hand, there are occasions when diagnosis and treatment may rest wholly on information communicated to us, and be quite independent of any physical examination of the patient. The communicated information may be partly volunteered, partly educed by questioning, and often no little skill is needed to get at the facts. Volunteered information is apt, especially among the uneducated, to become irrelevant, and when this happens we have to divert it into the right channel; yet we must not too readily check these spontaneous utterances; we must learn to be patient listeners, for among the many irrelevancies there may come the one bit of information that we want.

Nor must we too readily discredit the patient, even though the statements made appear exaggerated, if not untrue. Not infrequently, complainings of very genuine suffering are regarded as mere hysterical vapourings. I have met with more than one instance of this. If the patient's manner suggests hysteria, the inference may be too readily drawn that she is suffering from this and nothing else. I have known a woman who for years had been a victim to agonizing dysmenorrhœa, and who would have made almost any sacrifice for its cure, find great difficulty in getting anyone to believe she was not merely hysterical. I can recall, too, another patient, who on coming to consult me began by earnestly beseeching that I would keep an open mind, and not prejudge her case. "Before I tell you of my symptoms," she began, "let me beg of you to believe what I tell you. I have been to several doctors, and I cannot get any of them to believe that I have anything really the matter with me. They all seem to think I am simply hysterical, while I know that I am really ill. Will you give me a

fair hearing, for otherwise there is no use in my taking up any more of your time?" She then proceeded to tell a long story about eating some poisoned oysters that had remained in her "inside" ever since, and given rise to much pain and discomfort. Now, all this sounded very ridiculous, and it must be confessed, too, that the patient's manner was somewhat peculiar. Accordingly, I was quite prepared to diagnose her case as one of purely functional disorder; but upon examining the abdomen, I detected in the region of the right kidney a tumour of considerable size!

In investigating a case it is often necessary to inquire minutely into the daily life and circumstances of the patient. This course will enable us to map out a successful plan of treatment, when otherwise we might fail. Suppose, *e.g.*, a woman who controls a large business comes complaining of "nerves," and we find on inquiry that during a long day of harassing work she "never has five minutes to herself": we may suggest that she shall take her meals in a room alone, resting for at least half an hour after each, and that on no pretext whatever shall anyone have access to her during these times. This is a very simple, common-sense suggestion, needing no special learning to inspire it, but it may go a long way towards curing our patient. Suppose, again, that a pale-faced clerk consults us for indigestion, and inquiry elicits the facts that he takes a scanty mid-day meal, that when he comes home fagged in the late afternoon he indulges in that most pernicious of all meals—tea, consisting largely of jam and cakes, and that he winds up the day with a heavy indigestible supper: we may advise a more liberal mid-day repast and the blending of tea and supper in a good square meal at, say, 7 o'clock.

The following case shows the advantage, from the therapeutic standpoint, of carefully interrogating the patient:

Man, aged twenty-eight, athletic build, nervous temperament, good business man. Has for many years suffered from diarrhœa of the following type: Sometimes it comes on before breakfast—generally, however, immediately after; often it is postponed until he arrives at his office at 9 a.m.; it may also occur after lunch. He rarely gets it during the rest of the day, and he may be constipated for a couple of days. Sometimes the drinking of hot tea or coffee at breakfast causes his food to pass rapidly through him. Excitement of any kind—going to stay at a strange house, or the mere fear that he is going to have it—will bring the diarrhœa on. He smokes six pipes and many cigarettes daily. There are no symptoms of gastric dyspepsia, but he suffers at times from intestinal flatus.

In the above account I have only mentioned the points which bear on the treatment of the case, but it will be observed that a discriminating cross-examination was needed to elicit them. The treatment suggested by this history was as follows:

1. Diet confined to meat, bird, fish (all simply cooked), bread-crusts (chewed until liquefied), butter, grated Cheddar cheese. To drink sparingly with meals. [Though there was little evidence of faulty digestion, it was argued that the more perfect the digestion the less would be the tendency to the diarrhœa.]

2. Fresh fruit allowed after dinner. [This to take the place of vegetables, and ordered after the late meal because there was no tendency to diarrhœa then.]

3. Tea and coffee to be left off. [This because they were very apt to set up the diarrhœa.]

4. To stop smoking altogether [excessive smoking being hurtful to the nervous system and tending to produce laxity of the bowels, and the diarrhœa in this case being largely due to excessive nervous irritability of the alimentary tract].

5. To take *immediately on rising:* Ten grains of bismuth carb., 7½ drops of laudanum, with glycerine and water. [This to soothe the stomach, and obviate the tendency to the premature expulsion of food into the bowel.]

6. To take also thrice daily: Twenty-five grains of potass. bromid., 7½ drops of tinct. nucis vom., with glycerine and water. [This to allay the irritability of the nervous system generally.]

From the moment this treatment began the diarrhœa, which had lasted for years, stopped. The after-treatment consisted in gradually stopping the medicines, and removing the dietetic restrictions.

Such a case as this not only shows the importance of minutely questioning the patient as to his symptoms and habits, but also the value of common sense in treatment. The success here did not depend upon any profound knowledge of physiology, pathology, pharmacology, or any other -ology, but just upon common sense. And here I may remark that common sense has always been my best friend in treatment. My advice to the young physician is: Grasp the main facts of the case, and treat it on broad, simple, common-sense lines.

CHAPTER VII

ON CONSULTATIONS

THE object of a consultation between two physicians—say between a practitioner and a consultant—is that they shall confer over a case. Both should aim, *i.e.*, at making the consultation a genuine conference rather than a mere *ex cathedra* utterance on the part of the physician called in; though this is what it must amount to when the case is one of a kind wholly unfamiliar to the practitioner, but regarding which the consultant can speak authoritatively. Where possible, however, there should be a free exchange of opinion between the two, each being willing to learn from the other, although the practitioner will naturally be disposed to defer to the opinion of one who is called in on account of his special knowledge.

I say that each should be prepared to learn from the other, for undoubtedly consultations undertaken in this spirit may prove of no small mutual benefit. The consultant who has succeeded in culling useful medical knowledge from, say, a score of experienced practitioners will have made some advance in medical wisdom, and will be so much the more efficient in his profession; and contrariwise, the practitioner, by judiciously questioning the consultant, may materially augment his store of practical knowledge. Not a few practitioners, realizing this, are alert to embrace every legitimate opportunity of

securing a consultation, and thus they get familiar with the best tips, as well as perhaps with some of the fads and foibles, of many different consultants. Others seem less disposed to view a consultation in the light of an opportunity for increasing their knowledge, and, either from lack of desire to learn or for some other reason, forbear to put questions. With such the consultant may find it difficult to get into touch, and in consequence he very probably refrains from expounding a case as fully as he might perhaps wish, for let it be remembered that he is under the twofold disadvantage of not knowing how far the practitioner's own knowledge goes, nor to what extent the latter wishes him to dilate upon the case in point. On the one hand, by assuming a knowledge which is not possessed, he may be pouring unintelligible jargon into the ears of a bewildered listener; and, on the other hand, by postulating an ignorance which does not exist, he may be giving just cause for resentment; nay, he may be attempting to teach upon a subject regarding which the man he seeks to enlighten might well teach him. All this will be avoided if consultant and practitioner get into proper relation at the outset. To which end tact is needful on both sides.

The consultant and the practitioner do not in all respects stand on an equal footing: each has certain advantages over the other. In the matter of prestige the consultant generally has the advantage, inasmuch as he is usually called in as an expert. Hence the patient and the patient's friends are inclined to give the greater weight to his opinion, and though it may prove wrong, to accept it as against that of the practitioner, which may all the while be right. In this case time may justify the practitioner; but it does not always, as when, *e.g.*, the diagnosis does not admit of verifica-

tion. It behoves the consultant, therefore, to beware lest his prestige be not the means of an injustice being done to his confrère.

In regard to diagnosis, the advantage lies rather with the practitioner, for he has the opportunity of closely studying the case and also of reading it up, which, if possible, he always should do before the consultation comes off. The opportunity for close observation confers no small advantage. It was once my good-fortune correctly to diagnose a case which had puzzled many much abler physicians than myself; but, then, I had been able to watch it closely for many weeks, and it was not until the patient had been under my observation for some time that the true nature of the disease (verified post-mortem) flashed upon me. The consultant, on the other hand, has generally the advantage of special knowledge, and though he sees the case for but a short time, he is usually provided by the practitioner with an ample history of it, which, however, is rarely of quite the same value as direct observation. He may also have the advantage of being called in when the nature of the case has suddenly cleared up. Or, again, it may happen that, though the case has reached a stage when the diagnosis is easy for the doctor who happens to see it then for the first time, it presents difficulties to the practitioner from the very fact that he has been long watching it and is biased by the impression formed before the characteristic features had developed. I can remember diagnosing as enteric fever a case of acute tubercular peritonitis, and it was not until after more than a week that I discovered my mistake; whereas I should possibly have made a correct diagnosis right away if my first observation of the case had been deferred for a few days—had been made, *i.e.*, at the time when, under the bias of a false

first impression, I was still, as a matter of fact, regarding it as enteric.

It is well that the suggestion of a consultation should come from the doctor rather than from the patient or the patient's friends. He is the best judge as to the need for a consultation; and, further, by being first with the suggestion, he protects his *amour propre* from the wound it might receive were the suggestion of a consultation suddenly sprung upon him. Moreover, he is more likely to secure the consultant of his choice than when the suggestion comes from the other side. It may be urged that by himself proposing a consultation when the patient and his friends have the fullest confidence in him he is running the risk of shaking that confidence; but, as a matter of fact, this risk is small, and the practitioner who is partial to consultations is every whit as much trusted as the one who is averse from them; indeed, of the two he is probably the more trusted. For when the practitioner suggests a consultation, it argues that he realizes his responsibility, and is anxious for the welfare of his patient, who, it must not be forgotten, is very apt to regard his own case as unique. Much, of course, depends upon the way in which the suggestion is made. The doctor may point out that the patient's case presents certain unusual features (and what disease does not, seeing that no two diseases ever have been, nor ever will be, exactly alike?), and that therefore he would like another opinion; that, though he questions whether any further light can be thrown upon it, another physician coming fresh to the case might be able to find out something that had been overlooked, or be able to make some fresh suggestion as to treatment; and, if the case be a very grave one, he may point out to the friends that, though he does not think anything more can be done than he is doing, they would

like to feel, in the event of a fatal issue, that no stone had been left unturned, but that everything that could be done had been done.

One danger there is attending the suggestion of a consultation which must not be forgotten: it may alarm the patient and set him back; but this can usually be avoided by the exercise of a little tact. Sometimes it may be advisable to introduce the consultant without telling the patient of his coming until he is actually in the house.

Under what circumstances should the practitioner suggest a consultation? First and foremost, when he thinks that the patient is likely to benefit by one; next, when it is advisable that another medical man should share the responsibility of the case; generally also, perhaps, when the other side appears to be likely to take initiative. The question of the patient's means has, of course, to be taken into consideration; but this need seldom stand in the way, for besides that poor patients can generally be sent to hospital, our profession is never slow to waive the question of fees when these are a real difficulty.

The choice of a consultant may be rather a problem. It should fall on the man most likely to throw light on the case. But how to find him? I have heard it seriously suggested that, just as we have our consulting climatologists for the purpose of advising patients *where* to go, so there ought to be a class of physicians whose special function it would be to tell them to *whom* to go; much as a Commander-in-Chief, unable himself to carry out all the details connected with a campaign, is obliged to delegate special duties to special men. This suggestion, though somewhat far-fetched, serves at least to emphasize the necessity for every medical man

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to keep himself well informed as to who are the most skilled in the various departments of medicine and surgery. Not only is such knowledge of value in guiding him as to the choice of an expert whose opinion he himself might wish to have, but also in advising the public, who are constantly seeking his advice in this matter. This is all the more necessary in these days when catalogues of medical and surgical specialists are displayed on the bookstalls!

I, like others, have often been asked who was the right man to send such and such a case to, and not infrequently in regard to cases which I have felt quite competent to cope with myself—nay, as to which I have rather prided myself in having some special knowledge. The plan I have hitherto adopted under these circumstances has been to suggest some one other than myself; but I am by no means certain that it is always wise to do this. Not long since I received from some one I knew very well a letter asking me whether a certain London physician was *the best* man to whom to send a young man with incipient phthisis. This diagnosis had just been sprung upon the mother, who was in a state of great alarm in consequence. I wrote back saying that the physician in question was a recognized authority on pulmonary diseases, but that I could not vouch for his being *the best*, for there were several men equally skilled in this department of medicine; and the spirit moved me—I know not why—to write my friend a little homily on the subject of specialism and the absurd notions the public had on it. I pointed out that phthisis was a disease well understood by physicians generally; that no man was competent to hold the post of physician to a general hospital who could not give a sound opinion on a suspected case of it, and so on. To my surprise, I received by

return a letter expressing entire agreement with me, and saying that mother and son were on their way from the Continent to see me! Well, I found that the boy, who had been staying for some time at a health resort, had perfectly sound lungs—there was not the remotest trace of phthisis about him. A few days after, the mother came to consult me about herself. She was in a terrible state of "nerves," and informed me that her father had died of apoplexy at exactly the same age as she then was (forty-six), and that she feared something was going to happen to her. On feeling the pulse, it was clear that the pressure was enormously in excess of the normal, and it actually proved to be upwards of 180 mm. Hg. Ought I to have looked up the catalogue for the best authority on high blood-pressure and forthwith have packed the patient off to him? As a matter of fact, I did no such thing, and I had the satisfaction of myself reducing the blood-pressure to wellnigh normal proportions by judicious dieting and purgation, and thus, it may well be, of averting the dreaded stroke. This patient, it may be mentioned, had for years been wandering over the Continent in search of health, and not one of the many specialists she had seen had taken the elementary precaution of estimating her blood-pressure—*i.e.*, no one of them had discovered the one great fundamental fact, therapeutically considered, of her case.

Shortly after the mother first consulted me she brought her daughter, whose appearance was seriously blemished by an abundant eruption of facial acne: for this she had spent six weeks at a well-known continental spa, where she had daily face douches of a certain medicated water, at the recommendation, by the way, of a physician who never tired of telling his patients that the English physicians were no good. This eruption speedily yielded

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to the orthodox treatment as taught to every medical student over here.

Here, then, we have the case of a son said to be suffering from phthisis (to the great alarm of the mother), and being treated for it when the lungs were perfectly sound; a mother on the verge of apoplexy from excessive blood-pressure which had never been discovered, though she had consulted specialists and been through "cures" galore; and a daughter who had been put to the trouble of going through a prolonged and annoying, but perfectly useless, treatment for an easily curable malady. A strange trio, indeed. And what makes the whole thing so striking is that they had the means to secure the advice of anyone they wished, and of following out any treatment that could be prescribed. Yet they were actually worse off than the poor of London!

The reader will clearly understand that I do not introduce this incident in order to take credit to myself for special skill. What I did any average medical man could have done equally well. My object has been to show that it is not always wise, in the interests of his patients, for the medical man to hide his light under a bushel, and incidentally to point out the dangers attendant upon ultra-specialism, and the need for a comprehensive, all-round knowledge.

In making choice of a consultant, the question of availability comes in for consideration. As a rule, one living within a convenient distance has to be chosen, especially when he has to come to the patient. In country districts remote from large towns recognized consultants are rarely available, such consultations as are held being then for the most part between neighbouring practitioners. Meetings of this kind should in every way be encouraged, whether in town

or country, not only because two heads are often better than one, but because they tend to promote good fellowship among brother practitioners.

I have hitherto supposed the suggestion of a consultation to come from the doctor. It may, however, originate with the patient or his friends. The doctor must not be ready to take umbrage at this. Here the question of mental temperament comes in. Some are temperamentally inclined to welcome, others to resent, interference of this kind. The latter should, however, remember that it is only very exceptionally that the suggestion is put forward from any lack of confidence; rather it is that the friends (for it generally comes from them and not from the patient himself) want to feel that everything is being done that can be done, and let who will have had charge of the case they would yet wish for another opinion. The practitioner must strenuously fight against undue sensitiveness in this matter, and recognize that what he deems an injury to his self-respect is often but a mere wounding of his self-esteem. The sensible man soon learns this.

Whenever therefore the patient or his friends evince a strong desire for a consultation, the practitioner should acquiesce, unless they insist in calling in some one of whom he has good grounds to disapprove. What constitute good grounds in such a case it is not so easy to say. He would naturally refuse to meet anyone who had by his conduct placed himself outside the pale; he might legitimately raise a strong objection to a man much younger than, or of greatly inferior status to, himself. He should not (as I have known to happen), on the ground that he has complete mastery of the case, refuse to meet a consultant over a poor patient when a rich friend has offered to pay the fee. But whatever his

feelings, having made up his mind to consult with a certain man, he should enter into the conference *con amore.* Better that he should refuse outright than that he should meet a professional colleague in an aggrieved spirit.

The practitioner should, of course, dissuade from an expensive consultation where means are small and he is assured that he is doing all the good that is possible.

Consultations held in the patient's house are, on the whole, less satisfactory than those which take place in the consultant's room, because they are usually held over serious cases for which little or nothing can be done. Often the patient is moribund, and then the only good that can come of the consultation is that the friends are afforded the melancholy satisfaction of feeling that they have done all that lay in their power. Even in less serious cases the consultation may be scarcely more satisfactory. What the public do not sufficiently realize is that skilful treatment often implies daily close observation of the case, and that it is frequently impossible for a doctor to get his own treatment carried out through a deputy, however willing the latter may be to co-operate. This can only be done by frequent consultations, which are generally impracticable.

CHAPTER VIII

QUACKERY

HEALERS of the sick are by no means confined to those who have been through a laborious course of special study, and have become, by passing a number of severe tests, legally qualified to practise. Many set up as professed healers who have never seen the inside of a hospital, and whose therapeutic equipment must perforce be meagre. These illicit practitioners are of many sorts, and include cancer curers, truss-fitters, rubbers, Christian scientists, bone-setters, faith-healers, diet specialists, ear doctors, eye doctors, and others too numerous to mention, but all apparently having this in common—that they look with well-simulated contempt upon the trained medical man, and from the lofty heights of their self-complacency scruple not to make merry at his expense.

These unauthorised professors of the healing art reap a rich harvest, and, strange to say, especially among the educated classes, who are curiously ignorant and credulous in matters medical. "Our educated and literary classes," writes Mr. Brudenell Carter, "are as much the natural prey of every charlatan as minnows are the natural prey of a pike. We have seen the wife of an English Ambassador energetically supporting the pretensions of one of the worst of the tribe of cancer quacks. We have seen a

distinguished writer of fiction perish under the foolish administrations of so-called "Christian science." We have seen an English Prime Minister declaring the efficacy of vaccination to be an open question."

So long as this state of things lasts the quack will continue to flourish. But why does it last? How, indeed, has it come to exist? The answer is an indictment of our whole system of lay education. That system has long been in pressing need of reform. It has aimed too much at the acquisition of facts, and has neglected the infinitely weightier matter of teaching *how to think*. Instead of "educing"—"drawing out"—the latent mental powers, it has been concerned with "driving in" concrete facts and the ideas of other men—"cramming," in short. Children should be taught not so much isolated facts as fundamental truths. They should from an early age be familiarized with the principle of evolution, and with the fact that in all natural phenomena cause and effect follow one another with undeviating regularity. Were they early taught to look the stern realities of Nature in the face, and to grapple with the practical problems of life, they would be learning something of that most useful and most difficult of all sciences—the science of conduct; and they would be by so much the less likely in after-years to be deceived by idle pretences and pretenders. What we want to rear is a nimble-witted race, a race of level-headed men and women capable of forming sound judgments. A man may be highly cultured, may even be profoundly learned, and yet be quite uneducated in the sense of having his faculties so educed—drawn out—that he shall be able to comport himself wisely in his daily commerce with the world.

The surgeon probably suffers less at the hands of the quack than the physician, partly because the quack does

not dare to use the knife, and partly also because he is little likely to succeed where the surgeon has failed, though the irresponsible bone-setter, by rushing in where the more cautious surgeon has not dared to tread, may occasionally score a success; and such successes, it must be remarked, are widely acclaimed, whereas if the patient grows worse he is generally too ashamed to let anyone know that he has had any dealings with quackery.

With the physician, on the other hand, the quack enters into more successful competition, partly because the physician's power to heal is unhappily less than the surgeon's, and partly because the quack is able to employ to the fullest extent that most potent of therapeutic weapons, suggestion. This is, indeed, his chief stock-in-trade. With an assurance begotten of ignorance, and undeterred by any sort of misgiving as to the result, he unhesitatingly and indiscriminately promises a complete cure in every case; and there can be no doubt that in this way he sometimes cures where the physician has failed. I am constantly being told of wonderful cures wrought by illicit practitioners, and though some of them are purely imaginary, others are quite genuine. I have myself known of such. As an instance I may cite the case of a lady who had been an invalid for many years, and had consulted doctor after doctor without any benefit. Having been advised by one of them to go to a continental spa, she called, just before her projected visit, at a friend's to say good-bye. Here she chanced to meet a certain quack rubber, and was prevailed upon to consult him. He soon persuaded her that all her troubles arose from indigestion, and that he could cure her in a fortnight. The result was that she placed herself in his hands, and at the end of the stipulated time

declared herself—and, indeed, seemed to be—completely cured; and what is more remarkable, she has continued well ever since—now some years. The explanation is clear. The patient was just one of those highly impressionable, credulous individuals who are capable of being influenced by a strong, forceful personality, and by assuming towards her a determined, positive attitude from the first the quack scored where the authorized physician had failed.

The audacity, and withal the success, of this same fellow's methods were even better shown in another case —that of a patient suffering from thoracic aneurysm, which by pressing on the lower left intercostal nerves caused considerable pain in the region of the stomach. The pain, so our ingenious artist declared, was due to an ulcer which he could quite plainly feel in the anterior wall of the stomach; but he assured the patient that there was no cause for alarm, as he could remove it by a special kind of rubbing. Accordingly he put him through a course of daily treatments which consisted in placing the ball of one finger on the skin immediately over the supposed ulcer, and then very gently and slowly moving it round and round in small circles for ten or fifteen minutes (the fee for each rubbing being one guinea!). The patient, a highly intelligent man of the world, was made to believe that the ulcer got smaller day by day, that it was shrinking from the size of a florin successively to that of a shilling, a sixpence, a threepenny bit, until nothing was left but a patch of congestion, and this also, by dint of repeated rubbings, was finally dispersed!

THE ATTITUDE OF THE PROFESSION TOWARDS QUACKS.

This is an age of toleration, and probably the feeling of most medical men towards quacks, or at least towards many of them, is mainly one of good-natured amusement. But while there are some forms of quackery which the medical man can afford to ignore, there are others which he is compelled to oppose with all his might. He must protect the public against such dangerous characters as those who profess to cure cancer, hernia, and diseases of the ear—*e.g.*, mastoid disease—for in this way he may be the means of averting actual calamity. In other cases, as in bone-setting, where there is no question of placing life in jeopardy, he need not be so insistent; indeed, while the majority of bone-setters are ignorant, some few have no little skill, and, as already observed, they may sometimes even score off the surgeon. Such occurrences are, however, rare, and to suppose that the bone-setter can compare in skill with the experienced orthopædic surgeon—with one, *i.e.*, who has been through a laborious training, and who not only possesses the accumulated orthopædic knowledge of generations, but who keeps himself informed of every advance in orthopædic surgery which is being made throughout the world—to suppose this is manifestly absurd. Should, then, the subject of bone-setters come up for discussion, it is our duty to acquaint the public with the truth concerning these matters, but if our advice is not followed in regard to any particular case of bone-setting we need not, as a rule, greatly concern ourselves.

Similarly in regard to quack rubbers, by whom I mean people who profess to cure all manner of diseases by rubbing, and who arrogate to themselves powers transcending those of medical men. They probably do a

much good as other rubbers, and they are not likely to do any great harm. Food specialists may be treated with the same indulgence, more especially as there is little agreement among medical men themselves in the matter of dietetics.

As regards Christian scientists and faith-healers generally, we shall do well to point out to the laity that the curative value of suggestion has been known from time immemorial, and that this mode of treatment is employed by medical men themselves (although, truth to say, not to the extent that it deserves to be); and we may explain that if only these "professors" confined their treatment to functional disorders capable of being benefited by suggestion, they might well be left alone. But unfortunately they claim to treat other maladies as well, and when they attempt to treat diseases which cannot be cured by their methods but which the medical man can cure—such as, say, headache from eye-strain, or diphtheria—the matter assumes a different aspect; then the medical man is bound to speak out in no uncertain language. When, as I have known to happen, a school child who has been provided with glasses on account of headache from eye-strain is brought to a "healer," and the latter promptly takes the glasses away, we cannot smile indulgently at the procedure; and, again, when a patient stricken with diphtheria and irresponsible through youthfulness or sickness, is defrauded of the aid of one of the most beneficent discoveries of medical science, it is plainly our duty to do what we can to avert what may be an act of manslaughter.

NOSTRUMS.

A word also about nostrums, or quack remedies. Many of these contain powerful drugs. One nostrum in America is said to have made thousands of chloral

drunkards; others contain alcohol; others, again, opium; and both alcohol and opium inebriety may, and do (only too frequently), arise from the taking of them. All purveyors of such nostrums should be compelled to publish with each sample an analysis of its contents, that the consumer may at least be open-eyed as to its dangers. To allow this trading on the ignorance and credulity of the public seems to me unworthy of an enlightened people.

Doubtless a dread of unduly interfering with individual liberty partly accounts for our tolerance of the evil, the underlying idea presumably being that a person who discovers a remedy is entitled to keep it secret if he chooses, and to turn it to his financial advantage, just as a man who makes a new invention can claim the protection of a patent. But if we inquire into the matter we shall see the fallacy of the analogy. All over the civilized world earnest scientific men, and among them some of the acutest intellects of the time, are patiently and painfully labouring to fight disease, and ungrudgingly giving to mankind the results of their labours. Now, is it reasonable to suppose that a small number of isolated, non-medical men, working independently and ignorant of the mere rudiments of the medical sciences, should be more capable of discovering, or more likely to discover, effectual remedies than this army of choice and educated intellects, co-operating towards their great end? To allow this indiscriminate trading in secret remedies is surely to push the doctrine of individual liberty to lengths which can only be characterized as absurd, and at the same time to permit a wanton injury to the health of the community. I look forward to the day when the advertising of nostrums shall be prohibited.

In a recent letter to the *Lancet* upon this subject Mr.

Henry Sewell writes : " Quackery—always including th
quack medicine trade—now forms the favoured becaus
safe pursuit of a large section of the vast army c
clever cynical tricksters parasitic upon modern societ
They command large capital, and have virtually suborne
almost the entire newspaper press either to support the
or to remain neutral. With rare exceptions the pape
all, from high to low, accept a share of the vast sun
much more than £1,000,000 annually, disbursed in quac
advertisements."

CHAPTER IX

THE VIS MEDICATRIX NATURÆ—THE LIMITATIONS OF THERAPEUTICS

ONE of the first lessons the young physician has to learn—too many never learn it at all—is the limitation set by Nature upon his therapeutic measures. He has to grasp this primal fact—that she herself is the great physician, and that compared with hers his powers are feeble and insignificant. The potency of the *vis medicatrix naturæ*, the importance of relying upon it chiefly, of allowing it full scope, and not for ever, by fussy interference, impeding its beneficent action, was brought home to me early in my medical career. It was forced upon me by the following analogical argument which, though open to criticism as argument by analogy is bound to be, serves the purpose I have in view. The argument is briefly this: disease is a variation from the normal type, and just as, philogenically, all natural variations tend to revert to the normal, so does disease when acquired by the individual. This brings the *vis medicatrix* into line with the phenomena of reversion.

Now, there are two kinds of reversion. There is, first, reversion as commonly understood—that, namely, in which the organism does not develop on the ordinary lines, and of this variety I have nothing to say here.

Secondly, there is that form of reversion in which the organism, having partly or completely developed, retrogresses and thereby displays lost characters belonging to past ancestors.

It is to this second form that I wish to direct attention in this place. One of the most striking instances of it is afforded by acromegaly, most of the characters of which are anthropoidal—*i.e.*, belong to the man-like apes. As another instance, and one more useful for my purpose, we may take the case of a cultivated plant which has been allowed to grow wild—the cabbage, for example. Under such conditions it tends to assume the characters of its wild congener. In short, when placed under primitive conditions it tends to revert to a more primitive and stable state. Similarly, in regard to disease: disease is a variation from the normal stable state, and the organism shows a tendency to revert to that normal stable state when placed under normal conditions such as are afforded by warmth, fresh air, and suitable food. In each case the pendulum which has swung from the position of equilibrium tends to settle back in it, this backward swing in the case of disease being the work of the *vis medicatrix.*

But though it is easy enough to refer the *vis medicatrix naturæ* to the principle of reversion, when we come to examine carefully into the process by which nature heals we find that it is not by any means simple, but, on the contrary, inconceivably complex—a process in which the organism puts forth supreme efforts, bringing into play numerous mechanisms which have been laboriously evolved through the ages, and in the evolution of which as much care has been bestowed, if I may speak teleologically, as in the evolution of the many other physiological attributes belonging to

the organism — circulatory, respiratory, digestive, or what not. In other words, Nature is infinitely wiser in medicine and surgery (but especially in the former) than we are wont to conceive; she has a complete system of her own, and compared with her share in the healing process ours is small indeed. If once we get thoroughly imbued with this idea, and if we realize how crude and impotent are even our most delicate and successful methods compared with the efficiency and refinement of hers, we shall be the more inclined to trust to her wonderful healing power, always seeking to give it the fullest possible scope, and scrupulously abstaining from lightly employing means of our own, lest unwittingly we interfere with her work and only hinder where we hoped to help.

The surgeon is much less likely to err in this respect than the physician. He removes a piece of dead bone, pulls out a bad tooth, opens an abscess, and in all this he is acting in perfect conformity with Nature's own methods, only doing quickly what she must perforce do slowly. But though in such cases the results are obvious and unmistakable, how small and insignificant is the surgeon's share in them compared with Nature's! Take the case of a tooth extraction: great good may be done by this operation, which is as direct and rapid as it is effective, and yet even in such a case, where all the credit for skill seems to belong to the surgeon, and little or none to the organism, we find the actual facts, when we come to look deeper, to be far otherwise. The surgeon's share in the result begins and ends with the removal by gross mechanical means of the source of irritation. To Nature is assigned the infinitely more difficult task of repairing the injury inflicted by the operator himself in his effort at relief; and did she

fail in her part the patient would assuredly die, in spite of the removal of the irritant, the primary source of all the trouble. For consider how violent is the injury which he inflicts; bone is shattered, muscle, nerve, and connective-tissue are rent, vessels are torn, blood is poured out in profusion—all is chaos and confusion. But under the magic of Nature's touch out of that chaos and confusion order is swiftly and unerringly restored: armies of cells are engaged in the work of repair, and silently, slowly, with an adaptation of means to end a thousand times more exquisite than the utmost refinement of skill on the part of the surgeon, whose wrench, however deft, is coarse to brutality compared with Nature's imperceptible methods, the wounded tissues are repaired, and an architecture is built up again, infinitely more delicate and elaborate than anything that human ingenuity could devise. And all this is done so unobtrusively, unfalteringly, and painlessly, that we accept the ultimate result as a matter of course, giving little or no thought to the means by which it has been effected.

But if in surgery the *vis medicatrix* plays so large a part, how vastly greater is that which it plays in medicine? Here in the large majority of cases Nature effects the cure unaided, and even in those instances in which the physician does good, his share in the healing process is but small. Take valvular disease of the heart (on the treatment of which we are wont to pride ourselves), and consider the accurate readjustments which take place as regards hypertrophy and dilatation of the cardiac chambers, and changes in the valves* themselves.

* I have elsewhere shown that in obstruction of the cardiac orifices these latter and the passages leading up to them are so modified as to facilitate to the utmost degree possible the flow of blood through them (*Lancet*, March 10, 1894, p. 594).

And so it is with every disease which the physician is called upon to treat—Nature puts into operation special curative methods of her own. There is, so to speak, a great physician resident in each organism—a body physician, in fact—who treats every illness in a special way, and we must beware that we in no way interfere with that wise healer, nor arrogantly seek to teach her a lesson; rather let us work with her on her own lines and with open mind humbly learn of her.

This is not the place to attempt a study of these Nature-methods of cure; I am merely seeking to emphasize an important principle, and it will be sufficient if I call to mind what we have recently learned concerning the antitoxins. And what does this amount to? What but that the organism actually manufactures and administers medicine to itself!

All the great physicians of our time have grasped the fact—and it is more than half the secret of their greatness—that Nature is the chief healer, and that many diseases are recovered from quite as readily without treatment as with it. This is why it is generally found that, as the physician grows older, his methods become simpler, that he abandons drug after drug, method after method, and finally settles down into a plan of treatment which we can best characterize as based on the slightest possible interference with Nature. The young physician, crammed with theory and all the "-ologies," not unnaturally attempts to put into practice the knowledge he has laboriously acquired, and but too often it is to the great detriment of his patients. Over-assiduous, or rather over-officious, with the officiousness of inexperienced zeal, he must for ever be intermeddling, seeking to force Nature's hand rather than, as he should, to supplement her work. He is the helmsman—so he ingenuously

believes—of a storm-driven ship in dangerous waters, and his the task to steer clear of the rocks and shoals. Accordingly daily, nay even hourly, he worries his poor patient with treatment of some kind: if the temperature goes up he must reduce it; there is diarrhœa, he must stop it; or profuse sweating, this also must be checked. Eventually the patient recovers, and the physician fondly deludes himself that the recovery is due to his skill; whereas in all probability it would have been as quick, perhaps quicker, if after a few simple directions the patient had been simply left to the ministrations of a good, sensible nurse. I could cite numerous cases in illustration of this truth. The one which I shall quote, taken from the sphere of obstetrics, will answer my purpose as well as any other.

When I was on a visit in the country some years ago a local practitioner called on me, and asked if I would see a midwifery case with him. I explained that, though I was not altogether ignorant of obstetrics as taught in the books, I was not a practical obstetrician; but in spite of my disclaimer he continued urgent, and I consented to go, on the understanding, however, that I should not interfere with his methods, nor accept any responsibility in the case. It was a first pregnancy, and we both agreed that the presentation was a breech. As the woman had been in labour some time, he decided that a leg ought to be brought down. This view did not altogether commend itself to me, for there was no evidence of obstruction of any kind, and careful measurements showed the pelvis to be normal, the soft parts appearing so also. However, my colleague was confident as to the correctness of the procedure, and as he had had large experience I deferred to his judgment. After a good deal of effort one leg was got down, and shortly afterwards the second.

Whereupon—and before I had time to check him—my companion seized both legs and forcibly pulled upon them, with the inevitable result that the arms got extended over the head, and, the latter likewise extending, the chin hitched against the pelvic brim and became fixed there. There was little difficulty in delivering the arms, but the head, in spite of powerful traction made upon the body, stuck firm. The practitioner thereupon proceeded to decapitate. I suggested, but without avail, that this might not be an altogether wise procedure, since it would deprive us of a means whereby traction could be made. After the operation had lasted about half an hour the operator was quite exhausted, large beads of perspiration standing on his forehead; I accordingly relieved him, and by adopting the orthodox methods, such as lifting the child's body on to the mother's abdomen, etc. (it was an occipito-anterior case), eventually succeeded in delivering the head. This accomplished, what was my dismay to find the practitioner pulling on the cord for all he was worth. Matters now assumed a serious aspect; hæmorrhage became profuse, and the woman fell into a faint. Finally, however, to cut the matter short, we succeeded in getting the uterus to contract firmly, and the patient ultimately made a perfect recovery. As I bade him good-bye that night my friend said to me: "Well, what do you say to the case? I believe I can guess. You think that if we had left the patient entirely alone everything would have gone all right?" I nodded, and we parted.

Now, if ever there was an instance of meddlesome interference, and that of the worst sort, this was surely it. The wrongness of the methods adopted is self-evident, flagrant, all the accepted canons of obstetrics being deliberately set at nought; but I make so bold as

to say that we physicians not infrequently subject our patients to treatment every whit as pernicious, though, because it works insidiously and imperceptibly and does not comprise mechanical operations the effect of which can be accurately gauged, the harm done is not so readily appraised and brought home to us as in cases like that just cited. Let us boldly acknowledge the humbling truth that patients often get well, as in the above case, in spite of our treatment, not because of it; and let me urge the younger members of our profession to endeavour to realize early in their career the limitations of therapeutics, and not to wait till many years of hazardous experiment and painful failure have burnt the fact into their consciousness.

These limitations are, as already hinted, far greater for the physician than for the surgeon. A surgeon in extensive practice saves hundreds of lives and relieves untold distress by his direct personal intervention, and every day sees the physician more dependent upon his aid. The latter finds himself continually made most painfully aware of his own impotence and his dependence upon Nature and the knife, and never more so than in cases like perforated ulcer or intestinal obstruction, where, helpless himself to do more than indicate the nature of the trouble, he has to leave it to the surgeon's skill to rescue the patient from imminent death. I do not make these remarks to belittle the physician—the very difficulties which beset him make his efforts so much the more arduous, so much the more admirable—but solely that we may recognize our limitations, and be under no delusions as to our powers.

It is in the treatment of acute disorders that we feel, or should feel, our limitations most. The wisest treatment for most of them can be best summed up in the dictum: "Nature and the nurse."

Take the case of acute croupous pneumonia. The fact that so many different treatments are employed in this disease at once casts doubt upon the utility of any of them, and I am persuaded that we seldom cut short the attack or save life by adopting any measures beyond careful nursing.* The cure, if effected at all, is effected by the great physician within, who resorts to special means for destroying the pneumococcus, for neutralizing and eliminating the toxins (as exemplified by the "critical evacuations"), for removing the pulmonary effusion, and the like. I do not say that we may not sometimes help the *vis medicatrix;* far from it. One day, too, we may perhaps discover an antitoxin for pneumonia as efficacious as that employed in diphtheria, or some drug which shall be as effective as are mercury and iodide of potassium in syphilis, but at present we have discovered neither the one nor the other. I am even prepared to admit that we may occasionally—though I believe it is very occasionally—save life by judicious bleeding, by cardiac stimulants, by oxygen inhalations; nor do I deny that applications to the chest may sometimes do good, or that chloral may help in the delirium, and so forth. Nevertheless, we shall do well in all simple, uncomplicated cases of pneumonia to content ourselves with merely relieving distressing symptoms, and I would only sanction specific treatment in those exceptional cases where it seems very definitely to be called for. My advice in this, and indeed in most diseases, is: "When in doubt leave all to Nature, and do nothing." As an instance of harmful interference I may refer to a hospital patient of mine in whom the critical fall of temperature was marked by a profuse diarrhœa. This the house physician checked, with the result that the temperature rose

* See also p. 168.

again, falling, however, when the astringent mixture was withheld.

The second acute disease which I will mention is rheumatic fever. This, like pneumonia, is a germ disease, and we are as powerless to kill the germ of the one as of the other. I am doubtful whether our treatment for this disease is any better now than it was fifty years ago, or, for the matter of that, a thousand years ago, and whether, with the exception of those rare cases of hyperpyrexia where life can occasionally be saved by the bath, we have learned to diminish the mortality from this dread scourge by even 1 per cent. It was thought when salicylate of soda was first employed in rheumatic fever that the malady was to be henceforth robbed of its worst terrors. But what after nearly thirty years' experience do we find? That physicians are divided into two opposing camps—the one holding that it is right and proper to employ the drug, the other that the remedy is in itself baneful, and actually aggravates the morbid processes, though it relieves the pain. I think that for the purposes of my argument we may fairly set the one camp against the other, and regard the battle as a drawn one; which places us in much the same position as regards the efficacy of our treatment of the disease as we were in before the introduction of the salicylate. And what was the verdict then and before then? The statistics of Gull and Sutton show that the patients did as well on peppermint water as on anything else.

I next come to typhoid fever. With Sir William Jenner's discovery the physician leaped at once, in the matter of the treatment of this complaint, from darkness into light. Sir William Jenner taught us the necessity of careful dieting and rest. Add to this the reduction of hyperpyrexia by suitable means, and an occasional dose of

calomel perhaps, and in nine cases out of ten there is little more to be done. I find that my typhoid fever mortality well bears comparison with that of other physicians, and the guiding principle of my treatment is, after taking due precautions, to leave the cure to Nature.* I have satisfied myself that no drug has a specific effect.

Finally, I will instance acute nephritis. To read the books one would fancy that we had made enormous strides in the treatment of this affection within recent years. I can only speak of what I see, and my experience is that we have little or no control over it. Nephritis is presumably due to some toxin (or toxins) passing through the kidneys and exciting them into inflammation. But whence the origin of the toxin, and how prevent its production? Practically all we can do is to diminish the work of the diseased organs by limiting diet and getting the skin (though this helps but little) and bowels to act. No drug has the slightest effect on the morbid process. We may sometimes pull a patient through an attack of uræmia by bleeding, but after all is said and done the treatment of acute nephritis depends essentially upon "Nature and the nurse."

I end, then, as I began. Our powers are limited, nor can we hope by even the most enlightened therapeutic measures to usurp the great prerogative of healing which Nature has so jealously reserved to herself. She is sovereign, and all that we can aspire to is to be her ready henchmen, alert to follow the slightest leadings she vouchsafes us, as we pursue our unwearying search after wider and more intimate knowledge of the laws by which she works, and through which alone we can participate in her victories over disease and death.

* The diet I employ is that recommended by Dr. Selby—*i.e.*, *whey*.

CHAPTER X

INSTINCT AND REASON IN RELATION TO TREATMENT

I HAVE hitherto considered the *vis medicatrix* as a purely organic process, acting quite independently of the consciousness of the individual; but we cannot altogether exclude consciousness from among the inherent forces which make for the health of the organism. The conscious being himself controls, and in no small degree, his own destiny, what he shall eat and drink, what clothes he shall wear, what pursuits he shall follow—these, and many other things of a like nature, are yet within the choice of all but the very poorest and most unfortunate of men, however cribbed, cabined, and confined they may feel their lot; and the question arises how far this mental factor, whether in the shape of blind instinct or of a volition acting on the initiative of reason or experience, operates in the direction of preventing, or inducing, disease; or of ameliorating, or aggravating, it when already set up.

The lower animals are guided in matters pertaining to their health chiefly by instinct, which is to them an all but infallible guide. But instinct is only capable of acting as guide to an organism in a comparatively simple environment, and one, moreover, which has been much

the same for many generations past. Given such an environment, and a wellnigh unerring instinct will in process of time evolve by natural selection. The animal will come instinctively to search after the food that is wholesome, to avoid that which is injurious, and to protect itself against harmful agencies of many kinds; and this instinct will be constantly supplemented by the individual experience, or rather by "reason," if we take that term (as we are entitled to take it) to embrace all mental guidance which is not instinctive, even though it may not rise to the level of a conscious intellectual process. But in view of the sense in which the term "reason" is generally understood, it is safer to say that animals are helped much more by experience than by reason. If, therefore, there are introduced into the environment factors totally unlike any belonging to the ancestral environment, instinct, hitherto all-sufficing, becomes in respect of these new factors a wholly inadequate guide, and it takes long before, by a weeding out of the unfit, instinctive adaptation again occurs. The moth has not yet evolved the instinct to avoid the lure of the flame; but if countless successive generations of moths continue to be exposed to the danger of it, such an instinct will doubtless in the end evolve, by the continued survival of those for which the fatal attraction has the least force. Hence it happens that when we domesticate a wild animal we find instinct fail it in many particulars. If offered food of which its ancestors had no experience, it has to learn by its own to distinguish the wholesome from the noxious. On the other hand, it is remarkable with what persistence a primitive instinct may cling to animals which have long been domesticated, even though it may not have been called out for many generations. Witness the terror excited in the horse by the smell of the wild carnivora.

A horse passing a menagerie will quiver with panic: the very existence of its wild ancestors depended upon their ability to hold their own against the carnivora; no match for these latter animals in strength, their safety lay in their swiftness and in their sense of smell, which enabled them to scent their foes from afar; hence this sense became, and it still remains, highly specialized in them.

I say we cannot expect instinct to be a trustworthy guide, except in the case of animals inhabiting a simple environment, and one, moreover, which has been stable for several successive generations. It is clear that neither of these conditions obtains in the case of man, especially civilized man. His environment is infinitely more complex than was that of his primitive ancestors, and it has, moreover, varied, and continues to vary, very considerably from generation to generation. It has become, *i.e.*, unstable, and *pari passu* with, and as an inevitable result of, this increase in the complexity and instability of the environment, instinct has become less and less adequate as a guide, and reason more and more essential. Hence with the evolution of reason there has been a concomitant dissolution of instinct, until, when we arrive at civilized man, we find the one guide all but superseded by the other.

Now, this places man at a disadvantage as compared with the brutes, since the guidance of reason is not by any means so trustworthy as that of the instinct which it has replaced. It is needless here to enter into a psychological exposition of the defects of reason as the guide of man.* To do this with any sort of fulness and completeness would be to write a book on human

* See on this subject "The Causation of Disease," p. 197, by the writer.

error. But what does concern us, and that most intimately, is that under the working of this new arrangement, as we may call it, man is continually going wrong in matters physiological, and it is most difficult to set him right. Do not we physicians see him persistently sinning against the elementary laws of health with a temerity that is utterly amazing? It is often a task of much difficulty to enforce the most elementary principles of hygiene even among the educated classes; among the uneducated it is wellnigh impossible. Soldiers on campaign prefer the risk of contracting typhoid fever to the trouble of boiling their drinking-water, and in India the enforcement of sanitary precautions against such terrible pests as cholera and the plague is not only systematically resisted, but leads not infrequently, especially if it runs counter to racial and religious prejudices, to riot and bloodshed. We have had instances of this in Calcutta, in Poona, and in Cawnpore within recent years, and it was but a few years ago that the newspapers had to record the acknowledged failure of the Indian Government to enforce the plague regulations, and its consequent resolve to give up the attempt to stamp it out by coercion. "It is hopeless," so runs the report of the official committee appointed to collect evidence, "to carry out effectively any system of plague administration which runs counter to the feelings, susceptibilities, and prejudices of the people." But what a comment is such a statement as this on reason as a guide instead of instinct! Nothing, however, so strikingly shows the inadequacy of reason in this capacity as the flagrant errors into which it allows mothers to run in regard to the upbringing of their offspring, and in one particular—the feeding of children—I shall seek in its proper place to show that even we physicians have still something to learn.

Instinct fails civilized man in respect both of the quality and the quantity of his food. The late Sir William Roberts used to say that a man's palate constitutes his dietetic conscience, and doubtless the palate is a useful guide, as it is also certainly the one most acceptable to the "natural man." But it cannot be said to be a wholly trustworthy guide. The food of civilized man is presented to him in so appetizing and so concentrated a form that he is led to eat not only much that is bad for him, but also too large a quantity. The person with a constitutionally clamant appetite is thus far defective as regards his instinct; he derives great pleasure from eating, and this leads him almost certainly, his inward monitor failing him, to injure his health by eating too much, and the better his teeth and digestive organs the more likely is he to do this. A wise physician used to say to his gouty patients with strong, hard teeth: "You have good teeth; take care you do not dig your grave with them." Those with constitutionally small appetites, on the other hand, are better equipped in respect of food-instinct, and escape a great deal of trouble in consequence. Here I may refer in passing to the cravings of some people, especially pregnant women, for particular foods. These cravings, though often morbid and hurtful if indulged in, may yet at times be physiological promptings.

Instinct also often fails to prompt man to take the normal amount of exercise. In the natural state animals are compelled by the struggle for existence to lead active lives, and apart from this they take exercise—especially the young—for the sheer pleasure of it; but the struggle for existence does not now in the case of civilized man necessarily entail much exercise, and if not prompted by instinct to take his proper amount his health tends to suffer.

If, then, man's mental guides fail him even in regard to the most elementary laws of health, how much more untrustworthy must they be as a guide to health-conduct in its more complex bearings!

THE MENTAL GUIDES IN DISEASE.

It being so clearly manifest that, as concerns the avoidance of what is calculated to cause disease, man's guides are imperfect, we have next to ask how far they may be trusted when he is already suffering from disease? How far will reason, reinforced by such instinctive promptings as still remain to him, help the sufferer to get well? In answering the question we must bear in mind that, in so far as they help at all, reason and instinct must be regarded as part of the *vis medicatrix*.

It is in wild animals, again, that we find instinct operating most effectively in disease as it does in health. These lick their wounds and keep them exposed to the fresh air, thus anticipating the most recent advances of surgery in their efforts, Nature-led, to render them aseptic. There is good reason, also, to believe that they seek out herbs for their medicinal virtues: we know that our domesticated dog eats grass, apparently for the purpose of inducing vomiting. Again, a sick animal will creep into some dark corner, not only to hide from its foes but also for the rest and quiet so needful in grave disease; and doubtless instinct manifests itself among the lower animals when attacked by disease in many other ways unnoticed by us, ever acting, we may be sure, with that wisdom which characterizes all the measures of the great *vis medicatrix*.

One would expect that if instinct ever asserted itself in man, and asserted itself effectively, it would be especially in disease that it would do so; for disease dates back through untold generations—is, in fact, as

old as life itself. And if the living organism, working on purely organic lines and independently of consciousness, can, as it does, combat disease by means as complex as they are potent, as we have seen to be the case, we should certainly expect consciousness also, when it comes into play even in the lowly form of instinct, to operate in the same direction, as part, *i.e.*, of the great *vis medicatrix*. And let it be remembered in this connection that disease in its fundamental nature is the same in man as it was in his anthropoid ancestors, and in those yet more remote and primitive species that reach back in unending line beyond these into the dim dawn of being. I do not therefore see any reason for supposing that instinct so far as it determines man's conduct in disease has atrophied to the same extent as it has in its capacity to determine his conduct in health. There is yet another argument that may be urged in support of this view. Disease is, for the most part, a process of dissolution; in it man unevolves—if I may be allowed the word—slipping back to the condition of his more primitive ancestors, in whom we find instinct in its most perfect and efficient form.

We should therefore expect him to display—and there can, indeed, be no doubt that he does display—curative instincts in disease. The malaise, for instance, which attends acute illnesses, secures the rest which is so essential, and of which we can best realize the great healing virtue by calling to mind those cases of typhoid fever where, owing to its absence at the beginning, the patient has not taken to his bed until the disease has got a fatal hold. Again, the loss of appetite and the thirst in fever assuredly serve a good end, and the same may be said of the malaise of megrim, compelling as it does rest of mind and body. The loathing of

food felt during the attack further secures rest of the digestive organs, and the good effect of the abstinence is enhanced* by the vomiting (almost of the nature of an instinct) by which the flow of bile is stimulated and toxic substances are expelled from the body. These instinctive promptings are therapeutically suggestive. Many people, I believe, would be greatly benefited by an occasional fast and copious emesis, though the treatment is of such a nature that few will submit to it. Again, the exquisite pain felt in the arthritis of rheumatic fever is of the nature of a curative instinct, fixing the joint as in a splint, and, by the rest which it thereby secures to it, placing it in the best position for recovery. If only the inflamed cardiac valves could be similarly rested, who knows but that the endocarditis might clear up as completely as the arthritis? At all events, the valves would not be permanently damaged to the extent that they actually are.

It would, of course, be unsafe to allow our patients always to follow their instinctive promptings—in the matter of diet in typhoid fever, *e.g.*—but we shall do well, I think, to heed them more than we do. I could relate more than one instance of patients obeying their instincts in express contradiction to the orders of their medical advisers, and with the happiest results. Thus, a nursing woman with threatening mammary abscess was ordered not to put the child to the affected side; in consequence of this the breast got larger and larger, and in three days it had attained enormous dimensions and become agonizingly painful. Unable to bear it any longer, she disobeyed the doctor's orders (the latter had, indeed, forgotten to order the milk to be drawn off), and put-

* See further on this subject, by the writer, "The Physiological Aspect of Disease," St. Bartholomew's Hosp. Reports, 1895, p. 169.

ting the child to the swollen breast, she obtained prompt relief, the inflammation rapidly subsiding. I can also recall the case of a man who was kept in bed for many weeks with urethral fever, but steadily got worse. He was always saying he should never be well so long as he stayed in bed, and one day, taking the law into his own hands, he got up and went for a walk, and from that time forward he never, as he said, "looked back." I do not cite these cases as affording precedents, but in order to warn the physician against turning an altogether deaf ear to a patient's instinctive promptings, and to impress upon him the desirability of being prepared to consider how far they may be instinctive, and, as a consequence, safely indulged.

As a set-off against the cases just quoted, in which the patient's instinct proved a safer guide than the physician, I may mention the case of a child, a very poor hospital patient, who, when asked a few hours before his death if he fancied anything, promptly replied that he would like some "cheese and treacle," presumably the supremest luxuries which his poverty-stricken home had afforded. Here the prompting was scarcely physiological, but, alas! the little chap was beyond the stage at which the indulgence could harm him, and in obedience to the principle of euthanasia I unhesitatingly allowed his desire to be gratified.

THE EXPERIENCE OF THE INDIVIDUAL AS A HEALTH GUIDE.

While, under his present conditions, instinct is a most faulty guide to man, very clear indications as to what is good or bad for him may be derived from his individual experience. People differ so much in their idiosyncrasies that it is only in respect of broad general

principles that the physician can give stereotyped advice which shall be applicable to all. Hence he is often compelled to fall back upon the patient's experience, since in respect of many things the individual is a law to himself. Some are made rheumatic or gouty by meat, others can eat large quantities with impunity; some need to take much exercise, others can keep quite well while leading a sedentary life; and so in many other particulars. It is especially in the matter of food and drink that personal experience is helpful, and it behoves every man to find out for himself what things do, and what things do not, suit him. This truth is embodied in the saying that "a man is either a fool or his own physician at forty." Applying this test, I fear we must conclude, with the sage of Chelsea, that an immense number of men are fools. In the first place, people often take an astonishingly long time to find out that a certain thing is injurious to them; and, secondly, even when they have made the discovery, they often do not choose to act upon it. Incredible as it may seem, I have known a man fail to realize until considerably past forty years of age the fact that he always felt ill the day after he had dined out and eaten and drunk with less than his usual abstemiousness. It was only by casting his mind back and carefully thinking over the matter, that the truth was borne in upon him that for every digression from his usual habit he had to pay the penalty of a day's purgatory. Such extreme cases are no doubt rare, but it is certainly very common for persons to fail adequately to realize the quite obvious causal connexion between ill-health and acts of "physiological unrighteousness."

I recently spent a day with one of the sanest and most brilliant writers of our time—a man, therefore, who cannot be accused of want of intelligence—and during the whole

of it he was smoking, save only at table. As fast as he finished one cigar he lit another from it, and he told me that he had smoked in this way since he was sixteen years of age (he is now past seventy), except for one or two short periods of abstinence. It was quite clear to me that he was suffering from chronic nicotine poisoning, and I have little doubt that his recent work has suffered on this account. Yet he has never realized that the habit has harmed him, contending indeed that it must have done him good, because once when he left it off for a time the quality of his work fell below the usual standard; and no doubt the sudden abstinence after long habituation did interfere with his mentation, though I do not accept the conclusion that he deduced from the fact.

But while it is wise and right that every one should find out by experience what is good and what bad for him, it is by no means desirable that he should go to extremes, and allow the pursuit of health to become the religion of his life. This is despicable, and it moreover brings its own Nemesis, leading, as it does, to a morbid alertness for the appearance of unfavourable symptoms, and a constant dread of disease and death.

TEACHING THE LAWS OF HEALTH.

All children should be taught the elementary principles of hygiene. Now that the medical profession has spoken so emphatically regarding the desirability of children in elementary schools being taught, as a matter of routine, the advantages of cleanliness, pure air, temperance, and proper food, it is to be hoped that the suggestions made will soon be put into practice. To this end it is well that the educational authorities should be made to understand

that the teaching required is of the simplest, and that it can be quite easily adopted without interfering with other school-work. The great canons of health are very simple and easily comprehended, and admit of being written down in a space scarcely larger than that required for the Ten Commandments. There is no need to bewilder the children with high-sounding words and pseudo-scientific explanations, and I earnestly hope that the fatal error will not be made of supposing that in order to learn how to live healthily it is necessary to have a knowledge of physiology. Even medical men, with all the advantage of special training, can only attain—strive how they may—to a slender knowledge of this embryo science, and by attempting to teach its rudiments to children we shall but addle their poor little brains and obscure the great principles we wish to inculcate. What good does a child get from knowing where his kidneys are, or what they are for? or by studying those somewhat gruesome and assuredly most unlovely pictures of the human "inside" which so frequently disfigure the walls of the schoolroom? Far better that children should remain in entire ignorance of the structure and functions of their bodies. The body as an object of study should, in fact, be severely ignored by its possessor. It is he who lives in profound ignorance of the fact that he possesses a heart or a liver that is the happy man. Speaking for myself, I can confidently assert that my own knowledge of the structure and functions of my body has not in the smallest degree helped me to live healthily. I find it all-sufficient to live according to a few common-sense principles. The way people nowadays talk of their internal organs—of their livers, kidneys, and vermiform appendices—and the morbid interest they display in abdominal and pelvic surgery are amazing and occasion-

ally embarrassing. These topics are freely discussed among "polite" circles in the theatre, in the drawing-room,—nay, even the dining-room is no longer safe from their intrusion. Verily we are living in a realistic age!

Let me prove my contention that it is possible to learn how to live a healthy life without any knowledge of anatomy and physiology by reference to the subject of ventilation. In teaching this subject to a child there is no surer way to befog him and to obscure the grand truth that it is sought to bring home than by attempting to make him understand the anatomy of the lungs and the functions of the red blood-corpuscles. All that is necessary is to point out in the simplest possible language the good that comes from breathing pure air and the harm that comes from breathing impure air. The child should be made to realize that human beings need, like the flowers in the fields, fresh air and sunlight, and that they cannot, any more than the flowers, flourish in dark and stuffy dwellings, but without light and fresh air must, like these, wither and die. Appeals to his imagination, too, may be made by telling him how many of our soldiers used to die from consumption in the old days when they were huddled together in imperfectly ventilated barracks, and how, when they were provided with larger and better-ventilated dormitories, this disease became much less common; or, again, by depicting the tragedy of the Black Hole of Calcutta. Having given a few such homely illustrations of the good that comes from fresh air and sunlight and the evil that lurks in dark and foul-smelling places, what more is there to be said on the matter beyond a few practical hints as to the best way of securing proper ventilation in the home?

The mere teaching of principles is, however, not

enough: they need to be put into operation, otherwise they are apt to become nothing more than formulæ, like the catechism that is so diligently taught and so often repeated that it soon becomes a mere jargon of words, to be ground out upon occasion after the manner of the phonograph. It was, I believe, Herbert Spencer who insisted that preaching alone does little good. Ethics is not only a science, but an art—to some a very difficult art—only to be acquired after long and arduous endeavour. And so it is with hygiene. If real good is to be achieved in this direction the teacher must not rest content with a mere enunciation of its principles, but must see to it that they are as far as possible put into actual practice.

CHAPTER XI

HABIT IN RELATION TO TREATMENT

Periodic Habits.—Bodily processes, especially those occurring in the nervous system, tend by repetition to recur more and more easily, and when by frequent repetition considerable facility has been attained we say a habit has been formed. Habits, as popularly understood, consist for the most part of acts which, voluntarily or semi-voluntarily initiated, tend by constant iteration to recur with little or no volition. Such are nail-biting, sniffing, blinking, jerking the head, and kindred movements (habit spasms), eating fast, or getting up early or late. Habits may, however, also be formed quite independently of mental processes. If, for instance, a cardiac intermission is started from any cause, the heart may, by mere repetition of the process, get into the habit of intermitting, and continue to intermit after the original cause has been removed; in like manner the whoop of whooping-cough may persist for some time after complete recovery from the disease; similarly, the bladder may acquire the habit of spontaneously emptying itself during sleep; or, again, the repeated iteration of a neuralgic seizure may lead to a spontaneous occurrence of the attacks after the removal of the exciting cause.

Now, inasmuch as some habits are injurious to health or objectionable for other reasons, while others are

favourable to health, the physician has to reckon with them as factors in therapeutics. Manifestly he will seek to break his patients of injurious habits, and to inculcate such as are beneficial, and in this way the force of habit may be directed to therapeutic ends with the best results. But while habits which tend to promote health cannot be too assiduously cultivated, care must be taken not to become the slave of any habit. With increasing years habits grow on us, the protoplasm losing its plasticity and becoming more "set," as it were. This is a senile change, and we should all seek to ward off the disabilities of age and to retain our plasticity as long as possible. But even before the advent of senility, a person may, if he is not watchful over himself, get to be such a creature of habit, so bound down by routine, as to be little more than a machine; for it is to be noted that the more stereotyped a man's actions the more limited is his sphere of activity, and the less volitional is he—the more closely, in short, does he approximate to the instinct-led, machine-like brutes.* Moreover, there are grave inconveniences attaching to deeply-rooted, imperious habits. If a person accustoms himself to eat only particular kinds of food at particular times and cooked in a particular way, he may be upset, "thrown out of gear," as he would say, if he should be so placed that he cannot secure all three conditions to his liking. Sir James Paget, who, in his excellent "Studies from Old Case Books," strongly insists upon the inadvisability of becoming the slave of habit, goes so far as to assert that a person should not get into the habit of sleeping always on one side, or of going to stool at a regular hour. No doubt there is much soundness in this advice, which, generalized, amounts to

* See, by the writer, "The Differences in the Nervous Organization of Men and Women."

this: keep as plastic and adaptable as you can; do not allow yourself to be overmastered by habit. Though his advice was, I fear, for the most part a counsel of perfection, it should be carried out as far as possible; and if only for the moral effect of the self-denial and as an exercise in self-control, it is a good plan to abandon for a time habits such as smoking, tea-drinking, and the like. "I believe," says Ruskin, in a passage alluding to the asceticism of the early Christian centuries which I came across the other day, "no reasonable person will wish, and no honest person dare, to deny the benefits he has occasionally felt *both in mind and body* [the italics are mine] during periods of accidental privation from luxury and exposure to danger."*

Habituation to Circumstances.—So far I have been considering those habits only which pertain essentially to the nervous system and are periodic in nature. But "habit" is wider in its scope than these. The animal organism possesses the property of becoming adaptively modified, or "habituated," as we say, to circumstances, and this property also has to be reckoned with in treatment. By virtue of it structure and function may be profoundly modified,† and the organism enabled to work in harmony with the influences brought to bear upon it. It is in this way that man becomes adaptively modified by the conditions of his life—by food, climate, occupation, and so forth. These conditions may be such as to cause, when first encountered, actual disease, but

* "The Bible of Amiens," iii., The Lion Tamer.

† It is needful to distinguish between *adaptation* and *adaptability*. The latter is the ability to become adapted. It is one of the most remarkable attributes of living organisms, one, as I have shown elsewhere, that has slowly and laboriously evolved. See "The Differences in the Nervous Organization of Men and Women."

by virtue of his adaptability he may become so moulded by them as to react to them more and more harmoniously, until at length perfect harmony is attained—*i.e.*, complete adaptation, or habituation, to his environment. On the other hand, the environment may be of a kind to which the organism, human or other, can never completely adapt itself; but even so there is, except in the case of the most deadly agencies, always an attempt in this direction, with varying degrees of success—from almost complete failure to perfect success.

Instances of Complete Adaptation.—Acclimatization, or habituation to a particular climate, may be complete—*i.e.*, a climate which at first causes ill-health may gradually cease to do so. It is popularly held that a person's native air is the one best suited to him, and if such is the case we may explain the fact as an instance of early acclimatization. It is a matter of common observation also that people get accustomed to different kinds of food. Every nation has its own national diet, and when a person of one nationality takes to the food of another, he is apt to be upset by it until he becomes habituated to the change. It has recently been found that the composition of the digestive juices is greatly influenced by the kind of diet taken, each diet exciting just that particular kind of secretion which is best adapted to its digestion. In this way the glands acquire habits of secretion, so that when a long-accustomed diet is changed it may be some time before they learn to pour out the secretions appropriate to the new food. Those who are in the habit of eating bulky food containing an abundance of fibrous, indigestible material get acute indigestion if fed on more refined foods, the alimentary tract no longer being adequately stimulated by food sufficiently coarse and

bulky. The contrary is equally true. Again, a person accustomed to an active outdoor life is sure to suffer in health if he suddenly changes this mode of life for a sedentary one; and, on the other hand, one who leads a sedentary life may become so adapted to it that a very active life would do him more harm than good.

Partial Adaptation to a Morbid Environment.—Let us now consider those cases where partial adaptation to a morbid environment takes place. Tobacco-smoking affords a good instance. An amount of smoking which in the beginner causes alarming collapse can be borne by the habitué without apparent harm—perhaps without any harm at all; but the fact that such serious effects are produced in the beginner by very small quantities of tobacco suggests that tobacco-smoking in any but the smallest amount is necessarily poisonous, and that though the poisonous action is diminished by habituation, it never quite ceases. Experience seems to show that in large quantities tobacco is always injurious, though the evil effects may be unperceived. The same is probably true of alcohol. Some contend that even small quantities act injuriously—certainly large amounts do; nevertheless most people can to some extent adapt themselves to pernicious doses. An amount which in the beginner produces mental obfuscation—*i.e.*, a decidedly morbid effect—in the habitué produces no such result, a circumstance which may be taken to indicate that the agent is no longer morbid to him, or that, though still morbid, it is so in a less degree; but whatever may be thought of the effect of small quantities, it is quite certain that alcohol in large amounts does actually produce evil effects, whether recognized or not. In like manner a person may habituate himself to eat with comparatively little inconvenience an amount of food which, without

such gradual habituation, it would be impossible for him to eat, the morbid effects, though still persisting, becoming less and less obtrusive. Let me repeat, then, that habituation may conceal the evil effects of a nocuous agent, and that we must not too hastily assume that because no evil effect is perceived therefore none is taking place.

The fact that a partial adaptation to morbid agencies may occur suggests a further thought. A person may have become so far adapted to a nocuous agent, and his entire system so grown to and modified by it, that more evil may accrue from suddenly removing the morbid influence than from allowing him to remain under it. Thus an elderly man with a feeble heart, accustomed for many years to generous living, may be made worse by being suddenly deprived of all alcohol and put upon a bland diet. We must beware, in short, of the harm which may result from suddenly altering the patient's conditions of life, even though those conditions are injurious, and the older the patient the more should we be guided by this principle. Indeed, for that matter, we should beware of sudden changes of any sort —*e.g.*, from mixed feeding to pure vegetarianism, or from a fattening diet to severe Banting treatment. The more we keep in view the law of habituation, the less likely shall we be to err in this respect. Nevertheless, in the case of an unmistakably nocuous agent it is generally advisable to remove the patient from its influence with all possible speed. Even in chronic alcoholism experience shows that generally the most effective treatment consists in promptly and peremptorily cutting off all alcohol. Again, if a person has been eating too much, we may with safety at once limit the food to a sufficiency, though it may be more politic to reduce the amount gradually.

I will conclude my remarks on habit by quoting some

observations of Sir Samuel Wilks. That physician is reported to have said to an interviewer: "Habit is a great deal; it is second nature. A man accustomed to walk twelve miles a day cannot do without it. Every one has a natural temperament. Follow that and avoid excesses. That's all. A quack may tell you you must eat an ounce of albumin, so much starch, so much water, and so on, and what should you do? Go and have a nice chop. The instincts of the people are right. And what about exercise? Jenner would have said to you, 'I never walk at all, except from my house into my carriage. I hate walking, and if I could I would get my servants to carry me to bed.' That was Sir William Jenner, the Queen's* eminent physician. In the last three or four centuries we have done better intellectual work than ever before, and these have been the times of tea, coffee, tobacco, and alcohol. What can you make of that? Again I say, follow your instincts."

No doubt there is much wisdom in these words, but they must not be interpreted too literally; they must merely be taken as a protest against a too fussy interference with a man's habits and instincts. Nothing is more certain than that inclination often leads astray.

* Queen Victoria.

CHAPTER XII

RATIONALISM AND EMPIRICISM

How far is the physician rational and how far empirical in his treatment? Let us first define these terms. Empirical treatment is that which is founded on experience, and regarding the *modus operandi* of which we may be profoundly ignorant. The treatment of syphilis by mercury and iodide of potassium affords an instance; it has been discovered, as the result of repeated trials of different drugs, that these two are capable of greatly mitigating, and even curing, the disease; wherefore we give them in syphilis because experience has proved their use. We do not yet know, and it really matters very little that we should know, how they do good, though we may shrewdly suspect that it is by germicidal action; and if one day such is found to be the case we shall then understand the rationale of their action, and the treatment of syphilis by their means we may thereafter claim to be rational. As I shall presently argue, however, any strictly routine treatment, even though its rationale may be well understood, is in a sense empirical, since, while being hall-marked by experience, it involves no special process of reasoning, and comes to be a kind of rule of thumb. Rational treatment, on the other hand, is treatment which is founded on reasoning, and of which the *modus operandi* must there-

fore to some extent be understood. It presupposes a knowledge of the essential pathological features of the case we are treating and of the ends for which we are striving, and the adoption of special means to achieve those ends.

The surgeon is in the fortunate position that his treatment is nearly always rational. He knows exactly what is required to be done, and he adopts definite and eminently rational means of doing it. He cuts out a tumour, removes a stone, amputates a limb, sets a bone, reduces a dislocation—always with a definite, reasoned-out end in view. The physician is not so fortunately circumstanced. Nevertheless he also is able to infuse a good deal of rationality into his treatment. Let me give an instance from my own experience. A stout, gouty man, aged sixty-five, who had for many years led an active life and been a hearty eater, retired from business. Having little to interest him outside his own home, he now spent most of his time indoors reading, but, in spite of this entire change in his habits, he continued to eat and drink in exactly the same hearty way as before. After a while, and for the first time in his life, he developed bronchitis, which, beginning as an acute attack, gradually assumed the chronic form. During the course of the next eighteen months he saw several physicians, but he grew steadily worse, and became thin, irritable, short of breath, and tottering; he seemed, in fact, all at once to become an old man. His physicians led him to understand that little could be done for him, that he *was*, in fact, old, that his complaint was the penalty of his years, that at his time of life he must expect to have some infirmity, and that he must just make the best of it. Accordingly, their treatment consisted in little more than in giving expectorants: it was not a rational treat-

ment, and it failed. When I saw the patient, I ascertained that he came of a remarkably long-lived stock, that he had led a regular and careful life, that the condition of his heart and arteries was satisfactory, that his kidneys were sound, and, what was remarkable in one of his years, that his chest expansion was good. Upon these facts I made up my mind that it ought to be possible to rid him entirely of his bronchitis. I told him so, and explained to him why. I put in force a rational treatment, which I also carefully explained to him, and I succeeded in completely curing him. I argued: here is an old man leading a sedentary life and requiring, therefore, to take in comparatively little energy; the food needful to supply this energy is much less than he is now taking, for he is eating as much as he ate thirty years ago when in the full flush of vigorous manhood and in the thick of its activities. Probably one-quarter of the amount he now takes would be ample. His stomach, his liver, his kidneys, all his organs, are now thirty years older, and so much the less efficient. His digestive organs cannot cope with the large quantity of food he is taking; digestion is imperfect, and consequently an excess of poisons is poured into the blood; moreover, his organs of elimination being so much older and less effective, and the circulation through them, partly from his age and partly owing to his sedentary life, being so much more sluggish, these poisons are not properly eliminated. As a result the blood is surcharged with them; hence follow the anæmia, the irritability, the bronchitis—hence, in fact, most of his troubles.

The treatment I adopted was as simple as it was effective. It consisted—(1) in gradually cutting down the diet almost to starvation-point, so as to give the digestive organs the minimum quantity of work; (2) in

promoting elimination by means of hot water, calomel, and salines; and (3) in putting the patient through a graduated course of respiratory exercises, thereby not only increasing the input of oxygen and the output of carbonic acid, but stimulating the circulation through the lungs and the body generally—all of which, it need scarcely be said, are desirable ends in bronchitis. Finally, (4) I got the patient to spend as much time as possible out of doors. Stimulant expectorants and tonics were also given, but there can be no doubt that the cure was essentially due to the adoption of the rational treatment just described. I think I may fairly call it "rational treatment." It was not a rule-of-thumb treatment, but one reasoned out to suit the special circumstances of the case. This would be my definition of rational treatment.* I may say that I have since similarly treated many similar cases, and always with benefit, so that now it has come to be a routine method with me. And when a treatment is routine, *i.e.*, not specially reasoned out to suit an individual case, it comes to be, as I have said, in a sense empirical.

The force of my contention that a routine treatment, even though rationally devised, is for practical purposes empirical, is, I trust, obvious. It is matter of little moment to the physician who adopts it whether it originated rationally or empirically. The important fact is that it is applied as a matter of routine, without any special process of *de novo* reasoning; and be it observed that all routine treatment, even that initiated on rational principles, owes its justification to the fact that it has answered the test of experience. My meaning is made clear by reference to the treatment of myxœdema by thyroid extract, and of diphtheria by anti-

* See for another instance of rational treatment p. 59.

toxin. These methods are the fruit of close reasoning and prolonged experiment, but for which they might have remained undiscovered for all time. Once discovered, however, they are employed in exactly the same way as we employ mercury in syphilis, and the physician need trouble himself no more about the rationale of their action than need the microscopist trouble himself about the optical principles upon which his microscope is constructed. They have come to be routine treatments.

Concerning treatment by drugs, I strongly advise the physician to give them on the routine principle. Let him employ such and such drugs in such and such cases because they have been found by experience to be good in those cases; and let him not base his treatment by drugs, as the rational pharmacologist claims to do, on an assumed knowledge of their physiological action and of the morbid processes going on in the body. Did we possess a minute and accurate knowledge of the pathology of the diseases we are called upon to treat, and a correspondingly minute and accurate knowledge of the action of drugs, we might conceivably devise a rational system of drug treatment for each case of disease that comes before us, one that should antagonize the various morbid processes going on in the body, much as the chess-player meets the successive moves of his opponent. But think for a moment what a perfection of knowledge this would imply, and what endless opportunities for error would present themselves! I say we might *conceivably* devise such a system, but common sense tells us that it is altogether impracticable, and I repeat what I have stated elsewhere, that the physician should not allow himself to be deceived by such pseudo-scientific nonsense. I have as much respect for the alchemist of old as for the so-called "rational" pharmacologists of to-day; nay, I have

more, for the old alchemists were at least sincere searchers after right methods, and they did not sin against light. Suppose, for instance, we are treating a gouty patient. Such a one does not eliminate his uric acid in proper quantities, and the learned pharmacologist tells us—or used to tell us, for the view is now disputed—that salicylic acid forms with uric acid salicyluric acid, which, being highly soluble, is eliminated readily by the kidneys, and that thus the output of uric acid is increased. Now, shall we give salicylate of soda in gout because of this supposed action? or shall we employ a drug—this or some other—which experience has shown to be useful in gout, though we may be entirely ignorant of how it does good? Shall we, in short, employ the strictly empirical method or the pseudo-rational method? There should be no question as to our answer. If we are wise, we shall follow the empirical method.

The truth of my contention is well shown by observing the principles which govern the ophthalmic surgeon in his drug treatment. It is essentially routine. Let anyone visit the out-patient department of a hospital like Moorfields, and he will find that the surgeons there trouble themselves very little about rationale in their employment of drugs. For each affection of the eye there is laid down a routine drug treatment which has been tested by that best of all tests—results; and the best way to learn how to employ drugs most effectively in these diseases is first to learn to identify the diseases, and then to fix in our minds the routine treatment for each of them. A further and even more convincing proof of the correctness of my contention is afforded by the drug treatment of diseases of the skin. Probably in no class of disease are drugs employed so effectively as in these, and it is certain that the methods adopted are essentially

routine. Were a physician having no knowledge of the routine treatment of these affections to attempt to cure them on *a priori* considerations, he would make a sorry mess of it. To be successful he must first learn to recognize them, and next to apply the routine treatment of the experienced specialist.

I am not, of course, contending that we should banish all rationalism from our drug treatment. What I am contending is that we should rely mainly on experience. We are guided by rational considerations when, in a case of bronchitis, for instance, we give a sudorific to make a dry skin act, an aperient to relieve constipation, or an expectorant to liquefy a viscid sputum. We can, in fact, rarely wholly eliminate the factor of rationalism when treating disease, and I merely wish to insist that it should be kept within proper bounds.

And as with drug treatment, so with treatment in general: we should, as far as possible, rely upon sound routine—routine which has been tried and approved—while at the same time we make proper use of rationalism. The kind of "rational" treatment that I deprecate is that in which the physician is for ever meddling with his patient, watching the symptoms from hour to hour, and adopting special measures to combat the morbid processes which he believes to underlie them. I have already condemned this pernicious method in the chapter on the *vis medicatrix*. A broad, common-sense rationalism—not a meddling, finicking, pseudo-rationalism—is what is needed. Thus, if there is a source of peripheral irritation—astigmatism, impacted cerumen in the auditory meatus, a carious tooth—we seek to remove it; if a patient is overburdened with fat, we reduce his weight; if he is emaciated, we try to make him fatter; if he eats too quickly, we urge him to masticate properly; if the

kidneys cannot get rid of the nitrogen properly, we limit the nitrogenous input; and so forth. All this is simple common sense, but it is eminently rational.

I will complete my remarks on this head by contrasting a would-be scientific, or pseudo-rationalism with simple common-sense rationalism, as applied to the treatment of a case that came before me. A man, thirty-five years old, was a great sufferer from indigestion, and he had become pale, emaciated, nervous, and irritable. He went to the Continent and consulted several specialists there. They drew off the contents of the stomach at various intervals after each meal, and examined them chemically with a view to discovering the power of the stomach to digest different articles of diet; those which were not properly digested were removed from the dietary, until finally the patient was restricted to three or four. The amount of fixed and free acids was also carefully estimated, and special drugs were administered in order to correct certain defects that the calculation revealed. The result of this very scientific treatment was that the patient steadily lost weight, and that he got more anæmic, more irritable, and more nervous than ever. Yet this treatment all sounds very plausible, and the physician who adopts it, or the like of it, in such a case as this would no doubt persuade himself, and perhaps others, that he is very scientific and a most advanced and up-to-date exponent of scientific medicine; but he is really guilty of the worst form of pseudo-rationalism. When I saw this patient he was a veritable skeleton. I did not examine the contents of his stomach, but I got him quite well. I found that he had astigmatism (he was a great reader), and that his teeth were not as good as they might be. These errors were at once corrected, and then, as he was in a very exhausted state,

I had him put to bed and fed up. There was no need to be very particular about his diet, for from the very beginning he digested his food quite well now that the sources of irritation in the eyes and teeth were removed, and he was no longer scouring the Continent in search of doctors. The treatment I adopted was, in short, simple common-sense treatment. If the stomach had not digested the food, then I should have fed *per rectum*, and given the stomach a rest. I should in fact have kept to a common-sense rationalism all through.

CHAPTER XIII

SYSTEMS OF TREATMENT—FADS AND FADDISTS

Every physician tends after some years of experience to settle down into certain stereotyped methods of treatment of his own, and it is safe to say that these are never exactly the same for any two physicians. From this it is manifest that the profession allows itself wide latitude in the matter. This is due partly to the fact that the same malady may often be cured by several different means, but chiefly it is the result of the unsettled state of therapeutics. Of all the inexact sciences therapeutics is probably at the present day the most inexact and the furthest from reduction to a rigid system, and this, not because of any want of enthusiasm in those who devote themselves to it, but from the inherent difficulties it presents. As a consequence opportunity is offered for the exploiting of a multitude of methods and of endless cranks and fads. We are like children in the dark seeking for the light, and it is often impossible, when a new treatment is advanced, to say whether it will prove a true guide or a mere will-o'-the-wisp. Our ignorance does not permit us at once to silence the originator of what may ultimately prove a valueless—it may even be a harmful—treatment; we are compelled in fairness to give him a hearing; some of us, in the extremity of impotence, may

even be persuaded to try the treatment ourselves, and it may be years before it is relegated to the oblivion it deserves. Nothing better shows the unsettled and nebulous state of present-day therapeutics than the prevalence of fashions in treatment, pharmacological or other. It is scarcely an exaggeration to say that here fashion is as fickle and changeful as it is in dress. Every dispenser can testify to the truth of this so far as concerns drugs.

One obvious moral is deducible from these considerations. It is highly undesirable, not to say blameworthy, in the physician to advocate a new treatment without first thoroughly testing its efficacy. After Newton had been working for some years at his theory of gravitation there was still wanting some piece of evidence which should conclusively prove his point; so, instead of publishing his views to the world, he locked up his papers in a drawer where they remained for seventeen years. When he again worked at the subject the needful evidence was forthcoming, and the law was established upon an enduring basis. One can scarcely look for such restraint among our modern therapeutic enthusiasts, but it ought not to be too much to demand of them that they should at least make moderately certain of the efficacy of their methods before giving them to a too credulous world. Neglect of this precaution is burdening medical literature with much that is valueless, and rendering it an increasingly hopeless task to winnow the grain from the chaff. The worthlessness of such irresponsible communications is suggested by the fact that it is precisely the least eminent who are most prodigal of new methods. By all means let us seek to advance therapeutics, and be on our guard against that paralysing and deadly routine which is fatal to all progress; but let us also beware not to

advocate a new treatment before we have well tested the evidence for its efficacy.

Every physician has his fads, and it is perfectly right and proper that he should have them, provided that they have a sound basis; for faddism carries with it a firmness of conviction and an enthusiasm which issue in energetic action, and inspire the patient with a profound and most salutary confidence. What the physician has to be on his guard against is a *narrow* faddism. Let him have his fads, but let them be as broad-based as medicine itself. Note this significant fact—that fads become more and more narrow as the faddist stands lower and lower on the ladder of eminence. If a physician has one all-absorbing fad, and more especially if that fad rests upon a doubtful basis, depend upon it his mental horizon is limited; indeed, some faddists come perilously near the "fixed idea" in their fads, one notion dominating their entire medical thought. It is nevertheless a fact that some even of these narrow faddists achieve considerable success in practice, and for this reason: that the method of the faddist may be, and often is, well suited to a particular class of case, and, being carried out with enthusiastic conviction and persistency, does do undoubted good in those cases; no small part of the good resulting from the faddist's belief in himself and his system, which begets a like faith in the patient, and thus brings into action the potent factor of suggestion. Moreover, the faddist *has* a system, and it is often better to have a system of some sort, even a poor one, than no system at all. Hence the faddist may achieve brilliant results where others have failed, and the patients he cures bruit his fame abroad, and so increase his practice, while those who have got no good from his treatment probably hold their peace.

Now, if a narrow faddism can do so much, the obvious moral is that we should carefully study the methods of all the faddists, and seek to apply them severally to their appropriate cases. But herein lies the difficulty—to fit the treatment to the disease. It is easy enough to apply the same cut-and-dried treatment to each and every patient, but to apply to each case the correct method is a much more difficult matter; this it is that tests the true skill of the physician. The really great physician is a universal faddist. Speaking for my humble self, I confess that I am not only ready to listen to the views of the legitimately qualified faddists, but that I have gone out of my way to study also the methods of that large army of practitioners who have not been admitted within the portals of the profession, and I have learned much that is useful from them. Some of their methods well repay study.

Interesting and instructive though it might be, I forbear to give an exhaustive list of the fads of our profession, and will refer to a few only. Some are for starving all their patients, others for feeding them up; some believe in alcohol, others in staunch teetotalism; some are for a strictly vegetable diet, others for a mixed diet; some hold that little fluid should be drunk, others that it is well to drink copiously; some have a profound faith in drugs, others place little reliance on them. Then there are the grape-cure, the water-cure, the raw-meat cure, the sunlight cure, the mud-cure, and a host of other panaceas, each and all of which doubtless do good in certain cases: the mistake is to suppose that any one is universally applicable.

There are also unjustifiable and pernicious fads. We find one medical man resorting to a wholesale amputation of the clitoris, another referring all the ills of the body to the inferior turbinate bones, and advocating the knife

accordingly. It is pitiable to think what mutilations have been inflicted from such mistaken notions. And yet it is probable that there is scarcely any system of treatment which might not do good in some particular case. Were we to remove the clitoris from a thousand women in succession we should as likely as not benefit some one among them. I care not how far-fetched or eccentric the treatment we adopt, it will in all probability do good in some cases. Let us feed all our patients on boiled acorns, or starve them for a fortnight, or order them to drink many gallons of water daily, and although doubtless we shall kill many, we shall stand a good chance of curing a few.

CHAPTER XIV

SOME GENERAL PRINCIPLES

I MUST now ask attention to certain general principles which I have expounded at some length in my work on "The Causation of Disease"; and I shall seek to express myself as clearly and concisely as possible, convinced as I am that a thorough understanding of the principles in question is necessary to a proper conception of disease and its treatment.

LIFE A TWO-SIDED PROCESS.

First, then, I would ask the reader to keep ever before him the fact that life consists of the mutual interaction of the individual and his environment. In the case of unicellular organisms this truth is manifest, but we must never forget that it applies to multicellular organisms also—to man among others. As in the case of those amœboid ancestors of his which inhabited the salt ocean, every active living cell in man's body is bathed in a saline medium* containing nutrient substances and oxygen; and the essential vital changes of the body at large take place between the cells and their environing plasma.

It is needful to have a clear conception of the term "environment." In the case of a multicellular organism,

* The superficial horny cells of the skin are not thus bathed, but they are practically dead and in process of being shed.

such as man, it consists of (1) all those influences which operate from without upon the organism as a whole (=the external body-environment), and (2) all those which operate upon the individual cells from within (=the internal cell-environment).

1. The external body-environment includes the solid external world with its enveloping atmosphere together with all the influences operating through and within the latter: its condition in respect of humidity and pressure; its solid contents, microbic and others; and certain vibrating influences—thermic, actinic, luminous, electrical, sonorous, and the rest. It further embraces the macroscopic parasites, food, drink,* and clothing. It is also convenient, and in a measure justifiable, to regard muscular exercise as pertaining to the environment, since all muscle contraction is essentially a working against external force, which at the time of the contraction is thus exerting a specific influence upon the organism.

These external physical agencies influence man not alone in his purely physical aspect. Through his organs of sense they play upon his mental side also, evoking sensations, perceptions, and other psychic states. It is, moreover, essentially through a physical medium that man is influenced by the minds of others, living and dead, such influences constituting a mental, as distinguished from a merely physical, environment.

2. The internal cell-environment embraces all the multitudinous influences which operate upon the individual cells within the body: the cell-environing plasma, with its oxygen, food-stuffs, salines, effete matters, and the rest; and, again, thermic, electric, nervous, and other vibratory agencies striking upon the cells.

* It is to be observed that the alimentary, like the respiratory, tract is, strictly speaking, external to the body.

DISEASE ALSO A TWO-SIDED PROCESS.

Inasmuch as life consists of the mutual interaction of the individual and his environment, disease, which is a mode of life, may be defined as an abnormal interaction between these two great life-factors. I am aware that to make this definition strictly logical it would be needful to define the term "abnormal." Its meaning is, however, sufficiently clear for my purpose, which is to emphasize the two-sided character of all morbid processes. Each factor — the individual and the environment — necessarily shares in every morbid action, and we cannot exclude the one or the other from the causation of any disease.

HEREDITY PLAYS A PART IN THE CAUSATION OF ALL NON-TRAUMATIC DISEASE.

A due appreciation of this two-sided character of disease enables us to understand the important share taken by heredity in its causation, for seeing that disease consists in a morbid interaction between the individual and his environment, and that the organization of the individual depends essentially upon heredity—*i.e.*, he is what he is essentially by virtue of his ancestry—it follows that we cannot eliminate the influence of heredity from any non-traumatic disease. When an individual spontaneously develops such a disease as granular kidney or megrim, independently, *i.e.*, of any specific environmental agency, it must obviously—unless it is an entirely new development*—be inherited from some ancestor;

* It is, of course, possible that disease may arise in this way, and it might be argued that such pathological variations afford instances of disease in which heredity plays no part. Such cases, however, are probably of rare occurrence.

but when a disease arises from the action on the individual of some specific environment, such as a pathogenic microbe, heredity is apt to be lost sight of as a factor in its causation. One must, however, remember that, whether an individual shall or shall not respond morbidly to a specific environment depends, not upon that environment only, but also upon the inherited structural peculiarities of the individual himself. Some animals, for instance, are in no way injuriously affected by micro-organisms which to others are deadly. Thus the carnivora are practically immune from tuberculosis, and this immunity obviously depends upon organization, which in its turn depends upon heredity—*i.e.*, these animals are immune because of the immunity of their ancestors. Woods Hutchinson has suggested that this resistance of the carnivora to the tubercle bacillus has evolved by the survival through ages past of such among them as have not succumbed to tuberculosis derived from the carcasses of tuberculous prey; and there can be no doubt that the different degrees of resistance of different species, and of different individuals of the same species, to pathogenic microbes has been in large measure brought about by the operation of natural selection.*

We see, then, how impossible it is to ignore the influence of heredity in the causation of any of the multitudinous parasitic diseases, such as tuberculosis, ague, rheumatic fever, and malignant tumours. And the same remark applies to every disease due to the action of a specific environmental agency. Space does not permit

* I have shown how, by the elimination of the susceptible, a race may become adapted to pathogenic organisms, such as those which give rise to malaria (see "The Causation of Disease," 1889, p. 231 *et seq.*). Dr. Archdall Reid has independently advanced the same view (see, *e.g.*, his work, "The Present Evolution of Man").

me to develop this thesis at length, and for further arguments in its support I must refer the reader to my work on "The Causation of Disease" already alluded to. It is very necessary that this important principle should be properly understood; ignorance of it has led to much misconception.

ACQUIRED CHARACTERS NOT INHERITED.

The subject of the inheritability of acquired characters—diseases among others—has of late years been brought prominently before the profession by Dr. Archdall Reid, and in the controversy which he has provoked much confusion has resulted from several of the disputants failing to understand the meaning of the term "acquired character." We must, then, first be clear what we mean by it. When germ and sperm unite to form the *zygote*, there is started on its career an *embryo*, or new being. The new being may be regarded as some sort of structural mean between the two parents, but the zygote may be so constituted that the individual to which it gives rise may develop characters new to the species. New characters which thus take their origin in the zygote are known as natural variations, and are capable of being transmitted to future generations. It is upon them that natural selection operates, producing in the course of generations profound racial effects. Natural variations being thus of germinal origin are not, be it observed, acquired by the new being: they constitute part and parcel of its destiny as predetermined by the zygote. Acquired characters are such as are impressed upon the new being by the action upon it of specific environmental influences; the organism is capable of being moulded by its environment in a multitude of different ways, and it is these environmentally induced

mouldings which constitute the true acquisitions. Thus all the changes wrought in the nervous system by education are acquisitions, as also are mutilations and the hypertrophy and atrophy of organs from use and disuse, these being due to peculiar influences working through the cell-environment.

Now, careful search by the most eminent biologists throughout the world during the last twenty years has failed to discover a single unmistakable instance of such an acquired character being inherited. All the valuable acquisitions of the brain and nervous system die with the individual; and in the same way mutilations (such as pierced ears, circumcised prepuces, docked tails), though they may be continued through many successive generations, have no effect whatever upon the offspring. If a man develops his biceps muscles to the utmost capacity, his children are not born with these muscles larger than would otherwise be the case. Similarly, the ill-developed jaws and the defective teeth among the civilized are not due to any hereditary defect consequent upon their imperfect use through many successive generations: they are acquired for himself by each individual, and the defects are not transmitted. Were the children of parents presenting such defects fed from early infancy on coarse food necessitating the thorough use of the jaws and teeth, we should find these structures as well developed in them, if not as massive, as in the primitive savage.* To mention one other case only here: gout is essentially an acquired disease due to the action of a specific environmental influence, but because the individual has led a gout-producing mode of life his children are not on that

* It is probable that selection, natural and sexual, has had some influence in causing the jaws to be smaller among civilized than among primitive peoples.

account rendered more liable to the disease, though they may undoubtedly inherit from him the tendency to respond in the same morbid way to the same morbid environment.

The inheritability of new characters taking their origin in the zygote (=natural variations), and the non-inheritability of characters impressed upon the organism after it has started upon its developmental career (=acquired characters), are necessary corollaries of Beard's view concerning the mechanism of the hereditary process. This view, founded upon observations made upon the development of certain fish, is, to my mind at least, so satisfying that I cannot doubt its essential correctness. It assumes a continuity of reproductive cells from generation to generation.

Briefly, the view is this. The zygote, by its division and subdivision, gives rise to a "colony" of cells. These early cells do not constitute the embryo. Not until some hundreds of them have formed does one appear which is destined to become the embryo. The cell singled out for this distinction divides and subdivides, and the new being thus formed encloses the remaining cells of the colony which persist as its reproductive elements, these being, therefore, none other than the sister cells of the very cell whence the new being has arisen. Small wonder, then, that they should have much the same hereditary tendencies, and that new characters having a germinal origin (=natural variations) should tend to be transmitted. On the other hand, it is clear that on this view no specific influence operating upon the tissues of the new organism can produce inheritable effects (= acquisitions), since the organism does not actually reproduce itself; what we regard as the offspring being a partial derivative of a cell,

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sister to the primitive cell whence the so-called parent organism itself arose. I say "partial derivative," because two reproductive cells (ovum and spermatozoon) are needed for the formation of the zygote.

The individual is not the actual parent of his offspring, inasmuch as he does not from his own proper tissues produce the reproductive elements within him; he merely affords them shelter and nourishment. Viewed from the broad biological standpoint, the essential purport of the multicellular organism, be it a worm, an ape, or proud man himself with all his loves, his hates, his hopes, his fears, is in the last resort to provide a fit environment for the cell-colony. The organism is, in fact, a mere appendage to the colony, a subsidiary mechanism for providing the cells of the colony with the conditions needful for their continued existence.

Nor does this appendage even form part of the continuous biological chain which runs right through every series of living things: it constitutes a mere side-link which leads to nothing, breaking off, as it does, and perishing. The main chain, running back to the first beginning of life and destined to link the present with the future, is formed from the unicellular organisms constituting the cell-colonies. The real evolution has thus been, not primarily of the complex multicellular organisms in all their pride of endowment, but of unicellular organisms endued with vast developmental potentialities. This evolution has taken place by a survival of the fittest among them, the criterion of fitness in their case being the ability to develop complex appendages in the shape of organisms capable of survival in the struggle for existence and of thus securing the survival of the contained cell-colonies.

A little thought will show that species would soon

become extinct if acquired characters tended to be inherited. If beneficial acquisitions alone were transmissible, then indeed might man soar to heights undreamt of. Acquired excellences — physical, intellectual, moral—would be transmitted from parent to child, and would accumulate from generation to generation; individual knowledge would become limitless, and by assiduously cultivating the moral nature it might be possible to breed a race supreme in moral excellence. If acquisitions such as these were alone inheritable, the arrangement would indeed work admirably; but unhappily the individual often makes harmful acquisitions also. Few animals can live their normal term of life without suffering at some time or other from disease, and every attack of disease leaves its impress upon the tissues; in the case of civilized man disease is all too common, and its total effect on the tissues considerable. If therefore these morbid effects were inherited, it is evident that in a few generations they would accumulate to such an extent as to cause extinction.

NORMALITY IN RESPECT OF THE INDIVIDUAL AND THE ENVIRONMENT.

In seeking to discover what constitute the normal man and his normal environment, the prime fact to remember is that neither can be defined except with reference to the other. If an individual can keep healthy in a given environment, he is normal as regards it, and it is normal as regards him; if he cannot, then each is abnormal as regards the other. A negro can keep well in parts of Africa which kill the white man, and the white man can keep well in parts of Europe which kill the negro. The one is normal as regards the African

environment, abnormal as regards the European: the other is abnormal as regards the African environment, normal as regards the European. And similarly in respect of the environments: each may be regarded as normal or abnormal, according to the individual living in it.

This relativity of normality has an important therapeutic application. From it we learn that we cannot regard an individual as absolutely abnormal because he cannot keep well in an environment in which most people can. One who under average conditions suffers from megrim, asthma, gout, or rheumatism, may under other conditions enjoy perfect health, and it is the business of the physician to find out what those conditions are. Thus, there are few cases of spasmodic asthma but can be cured by residence in some particular region could we only discover it, and in relation to such a region the sufferer is strictly normal. In like manner victims of gout, megrim, and rheumatism may throw off these disorders under altered conditions of life, being as regards these altered conditions perfectly normal. As an illustration of the same principle, I may cite the case of a lady who suffers from bronchitis, indigestion, eczema, and general nervousness while living under somewhat harassing conditions in London, but gets quite well when she stays in Berlin, quickly relapsing, however, on returning to the old environment.

We must not, however, push this principle too far. I do not wish to imply that a person who can only keep well under carefully chosen conditions can be regarded as reaching a high standard of physical fitness; I merely wish to insist upon the relativity of normality. People differ considerably in their ability to cope successfully with different varieties of environment. The more

rigorous and varied the conditions under which an individual can keep well, the higher his level of physical fitness. Some there are who can live in many different climes, who can undergo the severest hardships, who can resist the onslaught of the most deadly microbes, be guilty of all kinds of excesses, eat enormously and indiscriminately, smoke all day, and consume large quantities of alcohol, who can endure great physical and mental toil, and in spite of all this remain in seemingly perfect health, though doubtless it is not with absolute impunity that they break any one of Nature's laws. Such are endowed, as we say, with magnificent constitutions. Others there are who can only keep well under comparatively simple and carefully chosen conditions, who must select a climate with the utmost care, live on the simplest food, avoid alcohol and tobacco, and limit themselves to moderate mental and physical labour. These, biologically considered, must be regarded as inferior animals. Nevertheless, they often live longer than their more robust brothers, partly because they are led to take better care of themselves and are thus protected from many agencies which make for destruction, and partly also perhaps because, though apparently frail and constantly ailing, their death-resisting power is actually greater.

And here let me observe that it is a great mistake to measure a man's physical fitness by his stature and muscular strength, as is so often done. Rather should it be measured by his power of endurance and his ability to resist death, both of which are independent of great stature and muscular development. The difference between a man of powerful, and another of slender, muscular build is much the same as that between the cart-horse and the race-horse: it is essentially a matter of breed.

As a matter of fact, tall men are generally less enduring and shorter lived than small men, and very muscular men may be in many respects delicate. A medical man who has had thousands of coolies under his supervision tells me that it is precisely those who have the best muscular development, and are thus most valuable to their masters, who are most frequently carried off by cholera.

Now, inasmuch as normality as regards the individual can only be defined in reference to the environment, and inasmuch as it is impossible to construct a rigid standard of normality for the latter, it is obviously impossible to construct such a standard for the individual either. Nevertheless we have a sufficiently clear notion of what constitutes a normal individual. He must be sound in body and limb, as popularly understood, and endowed also with a fair average of intelligence and moral capacity; he must, moreover, be capable, under an average rigorous environment, of maintaining health to a good old age, subject, of course, to those temporary departures from it which, under even the most "easy" possible environment (and, *a fortiori*, under the influence of those definite pathogenic agencies which the average environment entails), are inseparable from life. Our conception of structural normality should, in short, have reference not to any one portion of the life of the individual but to his entire vital span; and if under an average environment he contracts Bright's disease, rheumatic fever, ovarian cyst, strangulated hernia, cancer, or such-like disease, he does not stand our test, and must be regarded as abnormal. Were every member of the community to come up to the normal as just defined, then under a perfect system of sanitation the only deaths would be those due to accidental causes. And here I

would point out that the hygienist has fallen into the grave error of paying too exclusive attention to the environmental factor in disease.

THE INADEQUACY OF A PERFECT SYSTEM OF SANITATION TO SUSTAIN A HIGH LEVEL OF RACIAL HEALTH.

Sanitation is doing much, and will do more, for the public health, but it will never by itself secure a supremely healthy race. Its disciples assume that disease originates essentially in a faulty environment, and that by skilfully regulating the environment—*i.e.*, by a perfect system of sanitation—we can, single-handed and independently of the great principle of natural selection, rear a healthy race. This is one of the most grievous fallacies of our time. Never was there a delusion more fatal. We cannot beguile Nature with such a bribe; she will not be propitiated by having the environment carefully adapted to and made easy for each individual. The whole history of biological evolution is one long story of the *adaptation of the individual to the environment* by a ceaseless and rigorous elimination of the unfit; and it is in this way, and this way only, that a high racial efficiency can be sustained among men or any other living things. The hygienists are seeking—but they will ever seek in vain—to elude the inexorable law. Were the human species perfectly stable, showing no tendency to vary from generation to generation, their dream might perhaps be realized, but no species is, or ever can be, stereotyped. Individual members of it are constantly varying, many of them falling short of the average standard of excellence. No two organisms, indeed, are fashioned exactly the same. Taking all the children of a family, and striking their mean standard of fitness, we find that some surpass,

while others fall short of, this standard, and it is quite impossible to prevent racial deterioration unless those who fall far short are eliminated (as in the ordinary course of nature they would be), because by the law of heredity all natural variations tend to be inherited, and if the unfit are not eliminated, their number must increase from generation to generation.

I here refer to general fitness, but my proposition applies to each and every character of the individual. To take an example: A high *racial* (I use this term as distinguished from *individual*) excellence in respect of visual accommodation can only be maintained by a stringent elimination of those persons displaying errors of refraction. In civilized communities they are not eliminated, and consequently the race is deteriorating in respect of eyesight. In this instance the defect is generally remediable, and the loss is in the main an æsthetic one; but countless instances could be mentioned in which defective elimination is lowering the efficiency of our race, and leading to the survival of a vast multitude of the unfit. As a physician I am seeing every day of my life people whom I am compelled to class among Nature's failures—people who fall short of the standard which makes life worth living, people who in virtue of their unfitness suffer more than they enjoy. When, therefore, I see and share in the vain struggle to patch up such failures, and when I read elaborate systems on treatment, I ask myself "Why not look facts sternly in the face and strike at the root of the evil by conforming to the supreme and inexorable law?" Nothing is more certain than that it is only by a ceaseless and vigilant weeding-out of the unfit variations (which even under the most perfect system of hygiene must necessarily be born) that a high standard of racial excellence can be obtained.

But how shall we give full play to that searching process of elimination which alone can sustain a high level of racial fitness? Nature's method of elimination is a merciless one; she unhesitatingly sacrifices the individual for the benefit of the race—"so careful of the type" is she, so "careless of the single life." The sole object of individual elimination, racially considered, is to prevent the unfit individual from leaving offspring to inherit his unfitness, and Nature in her rough-and-ready way achieves this object by simply wiping him out of existence. The same end can be attained, however, by the unfit choosing to join the ever-increasing army of the non-marrying, and abstaining from begetting unfit offspring. Elimination, from the racial standpoint, means not having offspring, and all who do not leave offspring are racially eliminated—unrepresented in posterity.

The best way therefore—indeed, the only way—effectually to raise and sustain the racial standard is for the unfit to submit to voluntary elimination and to abstain from getting unfit variations. I am convinced that some day this will be done, and that the wilful getting of inefficient human beings will be looked upon as a crime scarcely less heinous than the destruction of those already launched into existence. Not only would it be possible by this abstention to raise the standard of physical and mental excellence and to diminish the tendency to disease, but it would also be possible (though some might think this undesirable) to extend the span of life almost indefinitely. As will be pointed out in the next chapter, a man does not grow old, as is so often assumed, by wearing out, like his boots. If such were the case he would begin to wear out from the very beginning of his existence; whereas it is precisely in the years of developmental life, when most energy is expended, that there is

least evidence of wearing out, the organism when undergoing the most wear and tear actually making steady advance in efficiency. The period of senility is as much a part of the physiological vital cycle as that of development itself.

I would observe, in concluding my remarks on this head, that I do not advocate any startling measures of reform. The change I have hinted at can only come gradually but come it must, and who fitter than ourselves to help on the consummation? Let the physician not shrink from doing his part to hasten it.

CHAPTER XV

THE BLOOD-PLASMA THERAPEUTICALLY CONSIDERED

It is of the utmost importance that the physician should realize how wide is the rôle of the blood-plasma in determining growth, development, and senile decay; how large a part it plays in disease; and how it is essentially by the establishment of a healthy condition of this fluid that most of his cures are effected. I shall, accordingly, devote this chapter to a consideration of the blood-plasma in health and disease, and in the following one I shall deal with practical applications.

I must crave the reader's patience here, as the subject is one demanding somewhat close reading.*

The human organism is made up of a vast congeries of cells, and its behaviour from the beginning to the end of life depends, on the one hand, upon the inherent properties of these cells, and, on the other hand, upon the influences which are brought to bear upon them from without. These influences are of two kinds—the plasmic and the non-plasmic.

The Plasmic Environment of the Cells.—All the cells of the body dwell in a saline fluid—the tissue-

* For a more detailed treatment of it I must refer the reader to a series of papers recently published in the *Lancet* (vol. i., 1907).

plasma, or lymph—a fluid which is derived from, and has much the same composition as, the blood-plasma; yet not quite the same, for apart from the fact that each type of cell tends to influence its environing plasma specificially, there are agencies at work regulating not only the quantity, but the quality of the fluid yielded by the capillaries to the different tissues. Nevertheless, the propositions, "normal blood-plasma means normal tissue-plasma," "abnormal blood-plasma, abnormal tissue-plasma," are substantially correct; and contrariwise.

The Non-Plasmic Environment of Cells.—Most of the fixed cells of the body come under the immediate influence of the nervous system; the human organism as a whole may, in fact, be regarded as a nervous system, having attached to the extremities of its efferent nerves, like so many leaves to the twigs of a tree, myriads of muscle- and gland-cells, all of which, in common with those of the nervous system itself, are held together by a connective-tissue framework, and the whole permeated by a complex vascular system containing blood and lymph.

Moreover, neighbouring neurons induce nerve-currents in one another, and the peripheral sensory neurons are acted upon by such agencies as gross material contact and the more subtle contact of atmospheric and ether vibrations (sound and light).

The Sources of the Blood-Plasma.—The bulk of the blood-plasma is made up of nutrient materials dissolved in water. These are derived from the food, and consist of the final products of digestion as delivered by the hepatic veins and the thoracic duct into the general circulation. We may regard the liver as putting the final touches on the process of digestion, and may thus speak of a primary digestion in the alimentary canal and a secondary digestion in the liver.

But though the bulk of the plasmic solids consist of nutrient materials elaborated by the digestive organs, it would be a great mistake to think of the plasma as formed by any special organs or tissues, for in point of fact it is the product of the united activities of the tissues generally. Not a cell in the body but leaves its impress on this remarkable fluid—not merely, be it noted, in the sense of adding useless waste material to it, but also in the sense of providing it with constituents—*e.g.*, hormones (such as those yielded by the thyroid and the adrenal glands), enzymes, and antibodies—essential to the normal functioning of the tissues.

Inasmuch as the blood-plasma is produced by all the cells in the body, it follows that each single cell contributes to the plasmic environment of every other cell, and seeing that the activities of a cell are largely controlled by its plasmic environment, it follows that *all the remaining cells of the organism play some part in determining the activities of any one cell.*

The Complexity of Plasmic Composition.—Such being the sources of the blood-plasma, it is obvious that it must have a highly complex composition. It is, in very truth, by far the most subtly complex fluid in nature, containing hundreds—nay, thousands—of substances, all in themselves highly complex and, for the most part, unanalysable. Let us ever strive to realize this, and to keep clearly in view the nature of this fluid in which, from the beginning to the end of its career, every cell of the myriad-celled organism lies bathed and through it subjected to an infinite variety of influences.

Variability in Normal Plasma.—In addition to this complexity of composition the plasma displays, even within normal limits, great variability also. It differs in different races, in different individuals of the same race, and even

in the same individual at different times; it changes, *e.g.*, for every epoch of life—such changes, as we shall see, actually determining the functional and structural peculiarities of those epochs; it varies with season of year, time of day, locality, climate, the nature and amount of food and drink consumed, the amount of exercise taken; and it varies also during menstruation, pregnancy, and lactation.

Variability in Normal Metabolism.—These plasmic variations lead to corresponding variations in metabolism, for it is manifest that the metabolism of the various cells of the body must vary with the nature of the plasma bathing them.

While recognizing, then, certain fundamental plasmic and metabolic features common to humanity in general, we must be keenly alive to the existence of variations among individuals, and in the same individual at different times. A dog can smell out such differences between individuals, if not the variations in the same individual.

Importance of the Gland-Cells in Determining Plasmic Composition and Metabolism.—The gland-cells take precedence of all others in elaborating and purifying the plasma, and consequently it is they which chiefly determine the character of the metabolism at large—which strike, as it were, the metabolic note of the individual, for it is by the gland-cells that the food is digested, it is chiefly the gland-cells which furnish the hormones, and it is by them that the blood is freed from its impurities.

Morbid Plasma.—The plasma may depart from the normal in a multitude of different ways. It may contain an excess, a deficiency, or a perversion of its normal constituents—food-stuffs, hormones, enzymes, and excreta.

It may further contain abnormal excreta,* whether these consist of poisons resulting from morbid metabolism (such as are found, *e.g.*, in diabetic coma), extraneous poisons (*e.g.*, alcohol and lead), or poisons of bacterial origin. When the plasma is poisoned by any of these, we call the condition "toxæmia."

I would direct special attention to a very common form of toxæmia among the civilized. I refer to that variety which results from indigestion—"indigestion toxæmia," as we may term it. Even in normal digestion poisonous substances—*e.g.*, albumoses and peptones—are formed in small quantity, but they are prevented from entering the general circulation by the gastro-intestinal epithelium and the liver, these two constituting a first and a second line of defence. In defective digestion these poisons are found in excess, largely as a result of bacterial agency, and they may cause toxæmia by breaking through the lines of defence. Indigestion toxæmia therefore results either from an excessive production of poisons, or—but of this we know little—from weakness in the defences.

In ideally perfect digestion the digestive products are delivered by the hepatic veins and the thoracic duct into the systemic blood-stream in the form best suited to normal nutrition. In defective digestion, however, this does not happen: the digestive output is abnormal. And let me here emphasize the fact that there are innumerable different kinds of indigestion, whether gastric, intestinal, or hepatic, each of which leads to its own particular defect in regard to that output, and to its own peculiar influence on metabolism. It is very necessary to keep this fact in view.

Having regard, then, to the many individual particulars

* The term "excretum" may conveniently be made to cover any substance which needs to be got rid of.

wherein the blood may be defective, and to the many different ways in which those defects may be combined, it is no exaggeration to say that the varieties of morbid plasma are infinite. Every disease—at least, every general disease—is, as it were, mirrored in the plasma, though as yet we but rarely catch the reflection; but who can doubt that an omniscient physician could with very truth say, "Show me the patient's blood, and I will tell you his disease"? And yet, how little we know of this subtly complex fluid, the arcanum of so many pathological secrets, the repository of so many therapeutic indications.

Variability in Morbid Metabolism.—It is obvious from the foregoing remarks that there must be as many different kinds of morbid metabolism as there are varieties in morbid plasma, and if we duly realize the fact we shall understand how impossible it is, in the present state of our knowledge, to make a satisfactory classification of diseases. There must, *e.g.*, be very many different kinds of morbid plasma capable of causing such affections as nephritis and arthritis, and it follows that there must be at least as many different kinds of nephritis and arthritis, since each variety of morbid plasma produces its own peculiar effects—a consideration which should abate a feverish desire to pigeon-hole every case of the one or the other that comes before us.

The difficulty of classifying plasmically-induced diseases—and by far the majority of diseases are of this kind—becomes further apparent when we consider that even in cases in which there is a definite, definable defect, as in Graves' disease and myxœdema, we may not be able to make a diagnosis from inability to decide upon the amount of hormonic defect in the one or the other that shall constitute the actual disease. A due recognition of such facts as these will often enable us to grasp the meaning—

in part, at least—of many cases which would otherwise puzzle us. It will prepare us to meet with borderland cases of classical diseases, such as the two just mentioned, and to recognize as essentially plasmic in nature many—all too many, alas!—to which as yet we can give no definite name—no barren achievement, after all, if it should lead us to realize that the proper treatment of them is treatment directed to setting right the blood.

We have now to consider the reaction of the component cells of the organism to their plasmic environment. To this environment each variety of cell responds specifically: the muscle-cell responds in one way, the gland-cell in another, the nerve-cell differently from either; and, again, each sub-variety of these cells has its own special reaction. The manner of this response of the cell to its environing plasma would seem to be by an actual union with some of the plasmic constituents. This union is either (1) with the actual protoplasm, as in the case of food-stuffs or toxins (=assimilative union); or (2) with some non-living substance—*e.g.*, fat globules or Nissl's granules—contained within the protoplasmic meshwork (=drug union). In the latter case the uniting plasmic constituent is concentrated within the cell, and may thus influence the vital changes between the living protoplasm and the plasma soaking it.

INFLUENCE OF THE PLASMA ON FUNCTION.

The plasma is able to influence cell-function in an infinite variety of ways.

Food-stuffs.—These are assimilated by the cell, being linked on to the side-chains of the protoplasmic molecules, a process in which enzymes play an important part, possessing, as they are now known to do, the

power of building up, as well as of breaking down, molecules. Each kind of cell elaborates its own special enzymes, their nature doubtless helping to determine the specific reaction of individual cells to the food-stuffs presented to them.

Enzymes.—These bodies also exist in the blood, and doubtless exercise a widespread influence on cell-metabolism. It is probable that diabetes results from some defect in connexion with an enzyme.

Hormones.—These produce very definite reactions on the cells of the body; carbonic acid excites the respiratory centre in the medulla, secretin acts specifically on the pancreas, while the phenomena of menstruation are now known to be caused by an ovarian hormone. Disease further affords striking illustrations of the functional effects produced by perverted hormonic activity; witness the vomiting, exhaustion, and fall of blood-pressure which characterize Addison's disease, and the long array of contrary symptoms met with in Graves' disease and myxœdema. In the one the vital fire blazes fiercely, as shown not only by the increased output of carbonic acid and urea but by the characteristic loss of weight, sweating, palpitation, and distressing mental perturbation; in the other, the furnace glows dully, as evidenced by the diminished output of carbonic acid and urea, the increase of weight, dryness of skin, slow pulse, and mental hebetude. In the one the skin is pigmented, in the other depigmented. In the one there is often exophthalmos, and in the other enophthalmos. Finally, in the one disease we find hypertrophy, and in the other atrophy, of the thyroid gland. This contrast strongly suggests that the phenomena of Graves' disease are due ...eraction, and those of myxœdema to under- ... thyroid (or parathyroid) function. There

can, indeed, be no doubt that many functional diseases are hormonically induced; for it is obvious that the plasma normally contains many different hormones, each the result of special metabolic activity, and that if health is to be preserved, the supply must be regulated with great nicety. It is probable, *e.g.*, that the nervousness associated with pregnancy, menstruation, and the climacteric is in part due to excess, deficiency, or perversion of some hormones secreted in connexion with those conditions. I feel assured that many cases of so-called "neurasthenia" also are hormonic in origin, for one may frequently observe cases of Graves' disease which shade off imperceptibly into cases indistinguishable from simple nervousness or neurasthenia. It is possible, too, that paralysis agitans is due to some hormonic defect, and that many of the functional peculiarities of old age are referable to pecularities in hormonic activity.

Normal Excreta.—These substances excite the activities of the cells specially engaged in excreting them, and so far have a beneficial influence on those cells; but when a particular excretum is in great excess, it tends to be eliminated by all the excretory glands indifferently, and, indeed, by all the surface-cells of the body, such as those of the skin and the mucous membranes, especially those lining the respiratory and digestive tracks. Some excreta, however—*e.g.*, carbonic acid and urea—have great difficulty in getting out by any other than the normal route.

The possibility of disease (such as inflammation) being set up in the tissues—*e.g.*, in the kidneys and the bronchial mucous membrane—by the unwonted escape of excreta through them, is worthy of consideration.

Abnormal Excreta.—These, whether the result of (1) morbid metabolism, (2) defective digestion, or (3) bac-

terial agency, or whether of (4) extraneous origin, are responsible for a multitude of functional disturbances.

1. As an instance of functional disturbance due to autogenetic toxæmia diabetic coma may be mentioned.

2. Indigestion toxæmia is responsible for a vast amount of ill-health, and demands more than a passing notice, the more so that in this form of toxæmia the physician can render real service. No one gets through life without at some time or another having his blood vitiated in consequence of defective digestion, while in some it is chronically toxic from this cause, with the result that life is spoilt and not infrequently cut short. Yet these toxæmias are often overlooked, being by no means necessarily attended by obtrusive gastric symptoms such as pain, flatulence, or acidity, by many erroneously regarded as the sole evidences of indigestion; for it is too often forgotten that the stomach plays but an insignificant rôle in the digestive process—that gastric digestion is, in fact, but the prelude to the real serious business of digestion which, beginning in the intestines, is consummated in the liver: it is essentially intestinal and hepatic indigestion which are responsible for the indigestion toxæmias.

Each of the innumerable varieties of indigestion produces its own special toxæmia and symptom-complex; some of these may be sufficiently definite to constitute distinct clinical entities, such as gout and rickets, but most of them are too indefinite to admit of individualization. Among the functional disturbances which may be thus set up are: headache, tinnitus, giddiness, and other cephalic sensations; irritability, mental depression, nervousness, drowsiness, disturbed sleep, bad dreams, lassitude, muscular weakness, tremor, twitchings, convulsions, pains in various parts of the body, palpitation, flushing, shivering, and sweating.

Abnormalities in connexion with menstruation are apt, by disturbing digestion, to cause indigestion toxæmia, which I am convinced is largely responsible for the functional disturbances—headache, flushing, shivering, depression—associated with them; though probably (as already hinted) perversion of the hormonic activities of the ovaries may play some part in their causation.

Among the different forms of headache which may be caused by indigestion toxæmia is megrim, which can indeed generally be cured by regulating the diet. It is interesting to note that the first effect of the poison producing megrim is often tonic and stimulant, the patient feeling preternaturally well; later, reaction sets in, with headache and malaise, as not infrequently happens after other poisons—*e.g.*, opium and alcohol.

Seeing that indigestion toxæmia is responsible for such symptoms as irritability, depression, and drowsiness, it may possibly play a part in the pathogeny of insanity.

3. The specific reaction of the cell to plasmic agencies is strikingly shown in the case of the bacterial poisons, which not only set in action those wonderful processes by which immunity is effected, but by their union with the protoplasmic molecules interfere with the functions of the cells, even to the point, it may be, of killing the patient. These injurious reactions play an enormous rôle in the realm of disease, and include, indeed, wellnigh every variety of functional disturbance, such as headache, giddiness, tinnitus, deafness, blindness, hallucinations, delirium, coma, insanity, twitching, convulsions, rigor, flushing, sweating, dry skin, tachycardia, vomiting, rapid breathing, and nausea.

4. The reactions of cells to extraneous poisons are equally numerous. Every drug, in fact, acts upon the tissues in a manner peculiar to itself. Among the symp-

toms thus resulting are headache, tinnitus, giddiness, blindness, changes in the pupil, stupor, delirium, coma, hallucinations, mental depression, paralysis, convulsions, numbness, tingling, dilatation and contraction of bloodvessels, sweating, dryness of the skin, tachycardia, brachycardia, nausea, vomiting, diarrhœa, constipation, ischuria, polyuria, albuminuria, glycosuria, phosphaturia, oxaluria, hæmaturia—their name is legion. It is interesting to observe that drugs can produce most of the symptoms met with among the insane. This is notably the case with alcohol.

Comparative Susceptibility of the Various Cell-Types to Plasmic Influences.—Of the different kinds of cells, the neurons are the most impressionable to plasmic influences, and probably the gland-cells rank next in susceptibility. This susceptibility of the neurons is well shown by the action of drugs upon them; indeed, most drugs produce their therapeutic effects essentially through the nervous system. This is necessarily the case with anæsthetics, hypnotics, anodynes, nerve-sedatives, and nerve-tonics, but it is also often the case with other drugs, such as purgatives, emetics, anti-emetics, sudorifics, diuretics, and drugs acting upon the cardio-vascular system; while, with the exception of the corrosives and the metallic irritants, it will be found that practically all poisons cause death by their direct action on the nervous system.

The susceptibility of the neurons to chemic stimuli prepares us for the conclusion that the plasma plays a predominant rôle in the production of nervous disorders.

Practical Conclusion.—Inasmuch as morbid states of the plasma are capable of producing an infinite variety of symptom-complexes, it follows that in all functional disorders we should seek for a possible cause in the con-

dition of this fluid. We must ask ourselves wherein it is faulty, whether in respect of nutritive ingredients, hormones, enzymes, or excreta; and having decided this point we must set resolutely to work to correct the defect, a task in which we shall find ample scope for the exercise of skill and judgment.

INFLUENCE OF THE PLASMA ON STRUCTURE.

The structure of the component cells of multicellular organisms is greatly influenced by their environment. We shall the better realize this truth by reflecting that whatever modifies the function of a cell—and we have seen how exquisitely sensitive is its functional response to environmental influences—modifies its structure at the same time: *whenever, i.e., a new form of functional activity is induced in a cell, whether through its plasmic or its non-plasmic environment, the cell undergoes structural modification in order to adapt itself to the agency causing the modification.* Structure and function proceed, in fact, *pari passu*, and the question—so long debated—which of the two takes the lead is irrelevant; whenever a cell is made to take on a new function its particles suffer an adaptive rearrangement which tends to abide.

The fact that the structure of the cell is throughout life so greatly under the control of its environment prepares us for the further fact that the growth and development of the component cells of the organ, as well as of the organism in its entirety, are largely determined by the nature of the environmental influences, plasmic or other, brought to bear upon the individual cells. In truth, the career of the cell from start to finish is as much the outcome of environmental influence as of inborn impulse; we might, indeed, almost say that the development of

the component cells of such a complex organism as man is due not so much to the operation of plastic forces working from within them as to their capacity to be moulded in definite ways by specific environmental influences. This plasticity of the cell under the moulding influences of its environment prepares us for the conclusion *that the cell environment, and notably the plasmic environment, is chiefly responsible for whatever disease may affect the cell, and that even the final senile decay of the cell results rather from intrinsic than from extrinsic causes.*

How do the cells of the organism come by their "inborn tendencies"? They are derived from the zygote (= fertilized ovum). We must suppose that every system of cells in the embryo has its counterpart representative in the zygote, and this representative we may refer to as its "zygotic rudiment." If the zygotic rudiment of a system of cells is properly constituted, and if the cells derived from it are throughout their career properly environed, they will pass through a normal vital cycle; but if either should be defective the derived neurons will likewise be defective. Thus, structural defect in a system of cells—*e.g.*, the nervous system—may be due to defect having its origin in the zygotic rudiment of that system; or it may be the result of some unfavourable environmental influence operating upon the individual cells composing it; or, again, to both these causes combined.

It is important here to point out that in respect of their environment a radical difference obtains between independent unicellular organisms and the cells forming part of a multicellular organism. In the former case not only is the environment comparatively simple, but it is much the same from the beginning to the end of the vital cycle. In the latter case, on the other hand, not

only is the environment infinitely complex, but it undergoes a constant series of changes from start to finish. In the one case the environment may be described as comparatively homogeneous and stable, and in the other as highly complex and changing.

Hence it follows that for the former the vital cycle—the various phases of development, maturity, and decay—must be essentially determined by inherent impulse, whereas for the latter that cycle must in large measure depend upon the cyclical changes which take place in the environment.

Influence of the Plasma on the Development of the Multicellular Organism.—Were the individual cell-environments to remain, during the entire post-partum life, the same as during the last day of intra-uterine life, little or no development would occur. Growth there would doubtless be, but it would be growth without development—a mere magnification of the infantile type. The structural changes which characterize the various stages in the vital cycle—infancy, childhood, puberty, adolescence, maturity, and old age—are all in large measure determined by the plasma. The composition of the plasma varies for each of these stages. As each is reached a particular spring is, as it were, touched, and the plasma is changed in such wise as to induce the structural changes characteristic of the stage attained. During the developmental period the tissues are urged by specific plasmic stimuli to develop along definite lines, in the absence of which stimuli they tend to remain *in statu quo*; while in the final stage they suffer senile decay, not so much because they wear out as because decay is deliberately thrust upon them by other specific plasmic influences, which thus check the tendency to corporeal immortality innate in all living things, and set a definite term to the length

of life. The organism commits, in fact, slow suicide through the plasma.

In saying this I am not denying that the cell has an innate tendency to become senile. There can be no doubt that it has. But, on the other hand, there can also be little doubt that this spontaneous senile decay might be long delayed under favourable environmental conditions —if, *e.g.*, the component cells of the body were constantly flushed with healthy adolescent plasma.

The influence of the plasma on development is shown in nothing better than in the phenomena of puberty, which, as we now know, are brought about by certain ovarian and testicular hormones. When the period of puberty is reached, the ovaries and testes are stirred into increased activity, and begin to pour their hormones plenteously into the blood. As a result the entire organism is affected to its depths: the metabolism of its every cell is altered, development is pushed forward along specific lines, the bodily conformation changes, new feelings arise, and the individual looks out upon the world with altogether other eyes. And all this at the promptings of a subtle essence yielded by two small glands! Surely no magic spell of fable ever wrought change more wonderful.

How greatly development and decay are under the control of the plasma is shown by certain irregularities which occur in respect of them, in response to certain abnormalities of the plasma. Thus the infantile type may persist, or puberty may occur prematurely, or post-maturely, or altogether fail to appear; and just as this stage may be anticipated or postponed, according to the time at which the plasma becomes pubescent, so may senile degeneration occur earlier or later, according to the time at which the plasma grows senescent. Thus

we may find senility beginning in childhood, or delayed to the eighth or ninth decade.

Influence of the Plasma in Causing Dissolution.—With a few exceptions, such as the physiological dissolution of the chromocytes and cases of genuine senile degeneration, it is safe to say that *degeneration never occurs spontaneously in a normally evolved cell.* Whenever, therefore, we meet with cell-degeneration, we must, with the reservations given, conclude that the environment of the degenerated cell is faulty, or that the latter has not undergone normal evolution.

And here I would observe that the term "degeneration" covers a much wider field than those degenerations discoverable by the microscope, for it is obvious that every gross, discoverable degeneration is led down to by innumerable gradations, at any one of which the degenerative process may stop short. The abnormalities of the plasma capable of setting up degeneration are due (1) to defective composition, and (2) to defective circulation.

1. *Defective Composition of the Plasma.*—The varieties of morbid plasma capable of causing degeneration are endless. A few only can be referred to here. As is well known, impoverishment of the blood may lead to atrophy and fatty degeneration; defects relating to its hormonic constituents may cause such degenerative changes as may be observed in myxœdema and acromegaly; but much the most important among the innumerable defects of the plasma capable of setting up degeneration are those pertaining to its poisonous excreta, whether products of normal metabolism occurring in poisonous quantities, poisons formed as the result of morbid metabolism, extraneous poisons, or, finally, the endless varieties of bacterial poisons.

Among the degenerative changes resulting from poisoned

plasma, those which occur secondarily to inflammation—*e.g.*, necrosis, caseation, and fibrosis—must be included, inasmuch as poisoned plasma, especially when the result of bacterial agency, is *par excellence* the cause of inflammation.

2. *Defective Circulation of the Plasma.*—This may result from failure in the forces of the circulation, or from local causes, such as arterial spasm and blocking or degenerative narrowing of the vessels. When from any of these causes a part is defectively supplied with blood, degeneration is bound to ensue within it. If it is wholly bereft of blood, the degeneration proceeds to necrosis; but if the supply of blood is merely curtailed, it stops short of this, and affects chiefly the more highly endowed tissue-elements, such as nerve-, gland-, and muscle-cells, while the more hardy connective-tissue tends to thrive at their expense. Thus are produced senile fibrosis and the fibrosis resulting from passive congestion (= brown induration).

I have said that the cell rarely degenerates spontaneously. Now, inasmuch as, so far as the cell is concerned, degeneration and disease are convertible terms (for a cell cannot, strictly speaking, be said to be diseased unless degenerated), this is tantamount to saying that a cell rarely becomes spontaneously diseased. I say that cell-disease implies cell-degeneration. In order to make my meaning clear here, it is necessary to insist upon the distinction between what may be called the egoistic and the altruistic functions of the cell. The primary function of a cell forming part of a multicellular organism is to maintain a vigorous individual existence; a secondary function is to administer to the need of the organism as a whole. Now it is im-

portant to observe that a cell may fail altruistically and yet maintain a vigorous vitality, and thus be, individually considered, quite healthy. One can, *e.g.*, understand how a group of neurons forming, say, a vasomotor centre, might fail in properly regulating the vessels they control, and how, again, a system of gland-cells might fail in the due elaboration of their enzymes or hormones, and yet as individual cells maintain a robust vitality.

But though disease seldom occurs spontaneously in the *cell*, it by no means follows that the like is true of the *organism as a whole.* This is because cells frequently fail in their altruistic function, and because such failure interferes with that harmonious interaction between the various parts of the body which constitutes health. In this way not only may functional disorder of the organism at large break out spontaneously, but more than this, actual organic disease—*i.e.*, altruistic cell-defect in an egoistically healthy cell, may lead to actual cell-degeneration in another cell. Thus atheroma can be induced in animals by the injection of adrenalin, and one can conceive that the same result might be produced by the excessive activity of the adrenal cells. In such a case we should have an instance of cell-degeneration in one group of cells being secondarily induced by the failure in the altruistic function of another group of cells, and one, moreover, of a kind actually suggesting excess of function — the result not of failing, but of exuberant, vitality.

Hence organic disease, involving actual disease (=degeneration) of individual cells, may break out spontaneously in the organism as a result of spontaneous failure in altruistic cell-function, without any spontaneous cell-degeneration whatsoever.

CONSTITUTIONAL DISEASE.

When in a disease the disordered blood-plasma gives rise to the essential features of that disease, we may speak of it as a constitutional, or blood-disease. In many cases of this kind—*e.g.*, gout, rickets, the exanthemata, peripheral neuritis, tabes dorsalis—we have no difficulty in recognizing the essentially plasmic nature of the affection; but if the conclusions we have reached concerning the variety of spontaneous cell-disease and the wide rôle of the plasma in inducing all disease are correct, it must follow that many diseases which we are wont to regard as originating in the affected cell-elements are in reality plasmically induced.

The same conclusion can be reached in a different way. A little consideration will show that such diseases as paralysis agitans, Graves' disease, myxœdema, Addison's disease, and granular kidney, could arise in no other way than through the plasma. In all of them countless millions of cells begin, symmetrically on the two sides of the body, to take on a specific form of disordered action. Nor is it inconceivable that they should at one and the same time do this spontaneously; but to this end there must be some common influence operating upon them, and the only medium through which an influence competent to produce the characteristic effects could operate is the plasma.

This line of argument applies to an enormous range of diseases. Most forms of insanity—other than those due to tumour or trauma—are plasmically induced. Assuming that spontaneous cell-degeneration is rare, we must conclude that in those cases of insanity in which the cerebral neurons are degenerated, the degeneration is produced through the plasma; and in those cases of

so-called functional insanity which completely recover, we must conclude that some morbid influence has operated upon the affected cerebral neurons, for we may lay it down as an axiom that spontaneous disorder and spontaneous recovery of a cell are incompatible. Such an occurrence would imply an inherent tendency on the part of the disordered cell spontaneously to deviate from the normal at a certain point in its vital cycle, and at a later period spontaneously to recover—an assumption for which there is no kind of warrant.

The nocuous influences which so disturb the cerebral neurons as to cause insanity may be either plasmic, non-plasmic, or a combination of both; but, as a matter of fact, all the non-plasmic causes, other than tumour and trauma, operate chiefly and essentially through the plasma.

CHAPTER XVI

CORRECTION OF THE PLASMA

We have now seen what a large part the plasma plays in shaping the destinies of the organism—how it determines the various phases of evolution, and how it is chiefly responsible for senile decay and for the majority of morbid processes. The rôle of the plasma in the genesis of disease is, indeed, all-predominating. Probably it is no exaggeration to say that the future of pathology and therapeutics is essentially bound up in this remarkable fluid.

From this dominating influence of the plasma in disease it follows that in every case which comes before him the physician should pay due regard to its condition. Generally he is safe in postulating some defect of it, and his chief concern should be to discover wherein that defect lies, and, having done this, to correct it. He should argue with himself: "If I can bring about a normal condition of the plasma, I can make my patient well." Doubtless it is not possible to make a complete cure when there is grave structural defect; nevertheless, it is remarkable to what extent even serious degenerative changes can be recovered from, provided that a healthy state of the plasma is established. Consider, *e.g.*, how completely the patient can

be cured of alcoholic neuritis, even when severe, if only he can be made to abandon his drinking habits.

The proposition " healthy plasma implies health " is in the main accurate. Exceptions may occur—*e.g.*, in such a disease as tic-douloureux, resulting from a lesion in the ganglion of Gasser; but cases of this kind are comparatively rare, and the physician may rest assured that he will seldom fail to cure his patients if he can establish a perfectly healthy condition of the plasma.

While assigning to the plasma this prominent rôle in disease, I am not unmindful of the part played by the nervous system also in pathogenesis, nor of the good which may be achieved through it. We should be most careful to remove every possible source of reflex irritation, such as eye-strain, and to get all the good we can by mental treatment, whether through education, change of scene, suggestion, or what not; yet even then, when all is said and done, it will be found that it is through the plasma that the good effect is largely brought about.

MEANS OF CORRECTING THE PLASMA.

In every case of disease in which we believe the plasma to be abnormal, the first question to ask ourselves is: What is the nature of the defect? Does it pertain to the nutrients, hormones, enzymes, or excreta, and if so, what is its precise character? Unhappily, we can but rarely answer this question with any degree of precision, though the key to the diagnosis and the treatment of most non-surgical diseases lies in it. I do not propose to enter here into the various methods at our disposal for discovering plasmic defects—that would be altogether beyond the scope of this work. I must content myself with briefly indicating the different

ways of correcting such defects when found. They may be grouped under the following heads:

1. Methods directed to the digestive system.

2. Methods directed to the excretory organs.

3. Methods directed to the destruction of bacteria, or the neutralization of their products.

4. Methods directed to the correction of defects in respect of hormones and enzymes.

Methods directed to the Digestive System.—In our endeavour to bring about a healthy state of the plasma we shall find that it is through the digestive system that we can as a rule work most effectually. This is because digestion plays a preponderating part in determining the composition of the plasma, for disorders of it lead not only to the impoverishment, but—what is of much greater pathological import—to the poisoning of the plasma; and also because the digestive system, partly from its large bulk and the complexity of its functions, but still more from its wanton abuse, is very apt to be thrown out of gear; so much so, indeed, that a sound digestion is but seldom met with among the civilized, the majority of whom suffer in greater or less degree from indigestion toxæmia, a condition constituting by far the most common cause of ill-health among us moderns. Be it remembered that sound digestion generally means sound plasma and thus sound health; while defective digestion always implies unsound plasma and consequently imperfect health. This dependence of sound health upon sound digestion has long been recognized. Among the Chinese our "How do you do?" is rendered by "How is your stomach?"

We shall the better realize the prominent part played by the digestive system in determining the composition of the plasma, if we reflect that of the sum total of

material agencies operating upon the organism from without—constituting, *i.e.*, its material environment—food occupies the first place. It is from the food that the tissues are built up; and it is from the food, together with oxygen, that the energy of the vital machine is derived. The conversion of this crude food into a form suitable for absorption and assimilation is a function of the first importance, one consuming a large share of the total energy expended by the organism, and requiring the constant activity of the most bulky system of organs in the body. This capacious system includes not only the liver and the pancreas, but some 30 feet of tubing, furnished with many millions of glands, and it contains on an average not less than one-half the total blood-mass.

Nor must it be forgotten that the function of the digestive glands does not end with digestion. They also furnish enzymes and hormones, which, entering the blood, play a necessary part in nutrition.

Here I would point out that it is essentially through the digestive system that climate benefits health. In most diseases it may be said that the patient does best where his digestion is best. No doubt other factors come into play, especially in such affections as bronchitis and rheumatism, in which the good effect of climate is largely produced by the direct influence of the atmosphere upon the skin and mucous membrane; nevertheless, it is essentially the digestive factor that we have to rely on in the climatic treatment of disease. It will be found, *e.g.*, that the benefit which a tubercular child derives from a stay at Margate is in direct proportion to the improvement which takes place in the character of his motions.

It is imperative that the physician should realize how large a part the establishment of normal digestion plays

in treatment. Not until he does will he be able to secure a full measure of therapeutic success, no matter with what branch of medicine he may decide to identify himself. For this reason the study of dietetics and indigestion should occupy a prominent place in the student's curriculum, and throughout the whole of his subsequent career be kept constantly in view. Nothing more forcibly shows the evils of ultra-specialism than the casual way in which these subjects are treated by many physicians. In whatever direction he specializes, the physician must at least learn the best that is known of the diagnosis and treatment of digestive disorders.

Let me here cite an incident which gives point to these remarks. Fully imbued with the truth I have just sought to emphasize, a physician of my acquaintance has for some time past been devoting himself to the study of diet, and in this connexion he not long since made an examination of the jaws and teeth of that splendid collection of skulls contained in the museum of the Royal College of Surgeons. Now, this greatly concerned an old friend of his who had docketed him "neurologist," and who urged that he was gravely jeopardizing his professional success by not sticking to his neurological last, that his conduct in thus straying beyond his own proper department was heterodox—nay, eccentric—"for, in the name of common sense, what have teeth to do with nerves?" My friend holds that there may be a very intimate connexion between the two, and he is satisfied that his excursions into the realms of dietetics and anthropology have greatly enhanced his efficiency as a practical physician, and not the least so among those of his patients suffering from nervous maladies.

Methods directed to the Excretory Organs.—When the blood contains poisons, an attempt may be

made to get rid of them by promoting excretion, and from the earliest days of medicine eliminants in the shape of purgatives, diaphoretics, diuretics, and emetics have been used for this purpose. With the exception of the first of these, however, it cannot be said that they are of much help in purifying the blood, and even purgatives act rather by preventing poisons from being absorbed into it than by promoting their elimination from it. Diaphoretics are of little value as blood-purifiers. A "cold" can sometimes be staved off by "getting the skin to act"—*e.g.*, by wrapping the patient up in blankets, or putting him in a warm bath; and the Turkish bath is occasionally of therapeutic service, though not so useful as the natural diaphoresis provoked by exercise. In uræmia diaphoretics are practically valueless, while as for such time-honoured practices as giving mist. am. acetate in febrile states, few would contend that they can have any appreciable effect in purifying the blood. Nor can it be said that diuretics are any more valuable for this purpose, except in so far as they act by stimulating a failing heart and thus move dropsical accumulations.

And just as we cannot get much help from elimination in relieving toxæmia, so, on the other hand, it is only exceptionally that any marked degree of toxæmia is attributable to defective elimination, except, perhaps, in the case of constipation. The fact is, normal excreta are rapidly run out of the blood, and only tend to accumulate seriously when there is grave organic disease of the heart, lungs, or kidneys.

In short, toxæmia results from the absorption of poisons from without, or from the undue production of poisons within, rather than from failure in the eliminating organs; and its treatment therefore should consist in the prevention of such absorption and such undue formation,

or in treatment calculated to neutralize the poisons, not in attempts to promote their elimination.

Methods of Coping with Bacteria and their Products.—We now know that the human organism has special methods of its own for striking at pathogenic bacteria and their products, methods which have been steadily evolving from the very beginnings of animal life. No branch of therapeutics holds out greater promise than that which is based on these natural methods. Treatment of this kind, rendered possible by the labours of such men as Pasteur, Behring, Koch, and Wright, is eminently scientific and rational. Before their time the treatment of bacterially-induced diseases was for the most part empirical. It is true that abscesses have long been treated by rational surgical means, and that the treatment of typhoid fever by cautious dieting, and of hyperpyrexia by the application of cold, may be regarded as genuinely rational. Speaking generally, however, it must be conceded that, prior to the advent of the new system, the treatment of the bacterially-induced diseases was essentially empirical, and very poor at that. In the case of such diseases as the exanthemata, pneumonia, diphtheria, rheumatic fever, our treatment, so far as any good has come of it, has essentially consisted, not in worrying the patient by fussy interference but in careful nursing, and while we have hugged ourselves with the belief that we have "pulled him through" by a specific line of treatment, it is Nature who has all the time been waging stern battle with the malignant foe. And how ineffectual and stupid our worrying applications to the diphtheritic throat now seem in the light of the modern serum treatment! how puerile our finicking treatment of pneumonia (on which whole libraries have been written), when we learn that at the crisis the opsonic index of the blood leaps upwards, in token that the great strategist Nature has completed

her plans for the final phagocytic onslaught which is to annihilate the pneumococci and thus remove the essential cause of the disease!

We have still a great deal to learn on the subject of immunity. So far as our present knowledge goes, the means adopted by the host for coping with bacteria would appear to fall under two heads—those adapted (1) to destroy the bacteria, and (2) to neutralize the poisons which they engender.

1. Speaking broadly, we may say that the bacteria are destroyed in one of two ways—either by the phagocytes, which engulf and digest them, or by means of chemical substances. These latter are of several kinds, and include the lysins, which actually dissolve the bacteria (as happens, for instance, in typhoid fever and cholera), and the opsonins, which so affect the bacteria as to render them an easy prey to the phagocytes.

2. The bacterial poisons are neutralized by the antitoxins, substances which have been administered with great success in diphtheria, tetanus, and botulismus. It would appear that these poisons are allied to the foodstuffs, and, like them, are capable of being linked on to the molecules of the living protoplasms, such assimilative union interfering with the normal vital activities of the cells. Now, the antitoxins combine with the bacterial poisons and thus prevent the latter from entering into union with the cell-protoplasm, and in this way time is given for the process of bacterial destruction to be carried through.

The treatment of bacterial diseases by the application of Nature's own methods consists for the most part in the administration of antitoxins and of substances calculated to increase the opsonic power of the blood. For this latter method we are indebted to the classic researches of Wright and Douglas.

In order that this treatment may be successful, the quantity of the substance administered requires to be carefully regulated in relation to the opsonic index of the blood. By due attention to this Wright, Bullock, and others have been able to obtain striking results in local tuberculosis, as well as in acne, furunculosis, and sycosis.

When we reflect what brilliant results have in so short a space of time been achieved by this method of treatment, we may confidently anticipate a splendid future for it. Treatment by drugs, dating back though it does some thousands of years, has, with a few exceptions, yielded but barren results. It was hoped that great things would come from a study of the physiological action of drugs, and that a reign of rational, as distinguished from empirical, drug treatment had by it been inaugurated; but, alas! such hopes have not been realized. While many useful drugs will doubtless be discovered in the future, the treatment by drugs seems destined long to remain essentially empirical. At last, however, a method of treatment has been discovered which is in the truest sense of the term scientific and rational, based as it is on the very method Nature herself adopts.

Methods directed to the Correction of Defects in respect of Hormones and Enzymes.—Whenever disease is due to a hormonic or an enzymic defect, the treatment obviously consists in correcting that defect. To do this we must first discover its exact nature, and this is seldom possible in the present state of our knowledge. We know that myxœdema is due to deficient thyroid action, and we are able to cure this affection by the administration of thyroid extract. Certain cases of infantilism, again, are apparently due to some defect in the pancreas, and can be greatly

benefited, as Byrom Bramwell has shown, by means of an extract of this gland. On the other hand, though there are good reasons for concluding that Graves' disease, Addison's disease, and acromegaly are due to perverted hormonic function of definite tissues, the treatment of them by the administration of an extract of those tissues has hitherto proved disappointing. Similarly, while evidence seems to point to the conclusion that pancreatic diabetes results from the absence from the blood of a pancreatic enzyme, no satisfactory treatment of that disease has yet been discovered.

But although at present we can do but little for this (probably large) class of disorders, we may reasonably hope for greater success as our knowledge of their pathology becomes more accurate.

CONCLUSION.

The object of this and the previous chapter has been to emphasize the importance of paying due attention to the blood-plasma in the treatment of disease. The whole art of healing consists in acting directly on brain and nerves (as by education, suggestion, and by removing peripheral irritation) and in correcting a faulty plasma — neither more nor less; and we may sum it up in the aphorisms, "Tend the mind and the nerves"; "Correct the plasma." There is no form of medical treatment but is embraced by one or other of these injunctions, and of the two the second is much the more important. Had we a temple of healing, over one of its doorways the words

Nervos atque mentem cura

might fittingly be inscribed, but over the main portal in letters of gold, should be placed the admonition,

Corrige plasma.

CHAPTER XVII

REMOVAL OF PERIPHERAL IRRITATION

HAVING in the last chapter dealt with the methods of correcting the plasma, we may now briefly consider the other great class of therapeutic measures, those, namely, which aim at acting directly upon the nervous system, either through the nerves (*e.g.*, by removing peripheral irritation) or through the influence of the mind.

PERIPHERAL IRRITATION.

Afferent nerves are distributed to all, or nearly all, the tissues of the body. The extremities of these nerves are furnished with "end-organs"—*i.e.*, structures adapted to respond to specific forms of stimuli, and the latter acting on the end-organs generate nerve-impulses, which stream upwards to the central nervous system. Sometimes these impulses, instead of promoting healthy nervous action, set up disordered action, which is then said to be produced by "peripheral irritation." Hence in all cases of functional nervous irritation the various "sensory peripheries" should be carefully explored as possible centres of irritation. In this inquiry we may conveniently begin with the head and travel downwards.

The Scalp.—Always examine the glands receiving the lymphatics of the scalp; enlargement of them sug-

gests irritation in the region of the scalp. Among the poor, pediculi constitute a potent source of irritation. The occipital region should be carefully examined. Note whether there is any undue traction on the hair, either from its being too heavy or worn too tight. Heavy head-gear may likewise cause irritation. One of the most injurious forms of head-dress is a heavy high hat, which causes considerable pressure on the scalp by reason of the hard rim.

The Eyes.—Eye-strain is responsible for a great deal of functional nervous disturbance. Primitive man used his eyes for near work very little. With civilized man, on the other hand, the eyes are often kept for hours together on near objects, and this implies a much greater strain on the muscles of the eye, both intrinsic and extrinsic, than obtains among primitive savages. Nevertheless, so long as refraction is normal, and so long as the blood is healthy and the neuro-muscular apparatus, by which accommodation and fixation are brought about, is sound, it is surprising how much near work the eyes can tolerate without suffering strain.

There can be no doubt that errors of refraction and fixation are much more common among the civilized than among primitive races, because among the former natural selection does not operate on the eyes with the same stringency as among the latter. A highly myopic or highly astigmatic savage could not long survive either in hunting or in war. There is, therefore, a double cause for the prevalence of eye-strain among the civilized —the frequency of optic defects and long-continued application to near work.

The Nasal Passages and Accessory Sinuses.—Disease in these regions and in the post-nasal space may constitute an aggravated form of peripheral irritation,

and they therefore demand careful exploration. The importance of securing free ventilation of the nasal passages is now universally recognized.

The Ears.—Examine especially for hardened masses of cerumen in the meatus.

The Teeth.—Each tooth should be examined separately for caries and pyorrhœa alveolaris; note if any teeth are impacted; examine also the "bite."

The Digestive Organs.—Disturbances of digestion affect the nervous system mainly by inducing toxæmia. They may, however, set up nervous disorders reflexly; witness the many different regions in which pain may be felt in indigestion. Perhaps the most potent source of reflex irritation proceeding from the digestive viscera is flatulence, either gastric or intestinal, but chiefly the former. A common result of gastric flatulence is palpitation, or irregular action of the heart, and though this may sometimes be due to the displacement of the heart by the distended stomach, it is, I am convinced, chiefly reflex; it is mainly when the gas distends the lower part of the œsophagus that cardiac disturbance is set up.

The Generative Organs.—Peripheral irritation may occur in the region of these organs, but while this possibility must not be overlooked, it is of great importance not to assume that such irritation is present when it is not. It is now known, for instance, that minor displacements of the uterus have little or no pathological significance.

The Skin.—A cutaneous disease, by the irritation it sets up, may cause considerable reflex disturbance. Under this head we may consider the reflex effects of unsuitable clothes, including tight boots, tight corsets, and every kind of clothing which causes discomfort. Inquiry should be made in regard to these points.

CHAPTER XVIII

PSYCHO-THERAPEUTICS

1. FAITH-HEALING.

THE mind, as is well known, exercises a direct influence over the body for good and for evil. Its influence for good may be utilized by the physician therapeutically, the knowledge of how to do this constituting a branch of treatment which we may term psycho-therapeutics. I shall here consider only one department of it—*i.e.*, faith-healing—and that only in so far as it can be employed by the general physician. Details can, if necessary, be gathered from special works on the subject.

I have already emphasized the importance of inspiring our patients with confidence, not only because this holds out the best prospect of getting our treatment followed, but because it brings to our aid all the therapeutic good that comes of faith. There is not the slightest doubt that the success of the physician depends very much upon his ability to make his patients believe in the efficacy of his methods, and we are beginning to realize more and more the very large part which faith plays in treatment, whether through medicines or otherwise. So potent is faith that an entirely inert remedy may, if implicitly believed in, effect a cure; thus, a simple bread pill, taken in the belief that it is an aperient, may actually cause

purgation, and it is certain that much of the benefit attributed to the action of drugs might with more propriety be attributed to the power of faith.

It is not advisable to attempt here an exhaustive explanation of how faith acts, since our object is to be practical; but I may refer to two principles which help us to explain its action. The first is that when the attention is concentrated on any one part of the body a definite change tends to be produced in that part; it is even said that vesication may be produced in this way. The second principle is that every idea tends to act itself out. A person standing on the brink of a precipice, and having the idea of precipitation suggested to him, tends to jump over. Indeed, I believe that if one idea alone occupies the mental field it will, if sufficiently vivid, necessarily act itself out. Hence a person with a vivid idea of self-precipitation (and such ideas are generally very vivid) will perforce obey the impulse, unless inhibited by another and antagonistic idea. In the well-balanced mind this second idea, or series of ideas, will come to the rescue and check the act; but if the mind is disordered, either no antagonistic idea arises, or, if it arises, it is too feeble to have an inhibitive effect.

Herein we have an explanation of the fact that a person in hypnotic sleep obeys the suggestions made to him. They become fixed in his consciousness—that is to say, instead of a series of ideas following one another in rapid succession, as happens in the normal state of wakefulness, the suggested idea persists to the exclusion of all others, and occupying the mental field alone, works itself out. This persistence of the idea suggested has its analogue in the imperative and fixed ideas which characterize certain abnormal mental states; also in the persistence of one idea under excitement. Thus a per-

son who has gone through some exciting experience—an insult, a great loss, an important crisis of any kind—finds it difficult to banish the idea of it from his mind: it recurs with troublesome insistence; the normal, easy flow of ideas is checked, and the one idea dominates the mental field. Now, the therapeutic use of suggestion is to implant such a dominant, persistent idea as shall either sway the conscious activities (through the will), or produce unconsciously some desired bodily effect.

In hypnotism the idea suggested does not fade away after the awakening from the hypnotic state: it persists for some time afterwards, and herein lies the value of hypnotism; but, as we shall presently see, we may implant a dominant idea, though perhaps not always so effectually, without hypnotizing the patient.

The physician, unless an expert, cannot resort to hypnotism with much prospect of success. In the first place, he is ignorant of the many little devices by which success is obtained, and which come by experience alone; in the second, patients have not the same faith in him as in the acknowledged expert. When a patient consults the expert it is with a firm belief in that expert's powers, and to this belief he owes much of his success.

But while it is best to leave hypnosis to the adept, the physician may often, by means of suggestion without hypnosis, implant a dominant idea that shall react beneficially upon the body. In order to do this most effectively we first get the patient into a receptive state of mind, and next we present an idea to him in a manner calculated to fix it.

We will suppose that we have to break a patient of a drug-habit: we get him to lie down, to relax his entire muscular-system as much as possible, to take slow, deep breaths, and to allow his mind to remain—as far as may

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be—a blank. In order to test the state of the muscles we occasionally lift a limb; not until it drops in a perfectly limp, inanimate fashion have we secured the requisite relaxation. We must be especially careful to see that all the muscles of the face are completely relaxed. Often the brows remain knit for some time, and so long as this continues it is clear that we have not secured the needful mental repose. When we have got the muscles completely relaxed, or even before this, we place the palm of one hand upon the patient's forehead and make gentle pressure, or we move the hand slowly up and down over the face, so close as nearly to touch it. We then, in as authoritative and convincing a way as we can command, suggest the wished-for idea, telling the patient, for instance, that he will have no difficulty in abstaining from the drug for such and such a time; and having implanted this idea, we ask him to concentrate his whole attention upon it and, while thus occupied, to remain in a perfectly quiescent state for some minutes, after which we allow him to get up slowly. This procedure should be repeated from time to time.

Or, again, suppose we desire to remove a pain, nausea, or other unpleasant sensation. The patient having been prepared in the way described, we place a hand where the symptom is felt, and then assure him that it will get better, that it is getting better, that it has gone. It is quite remarkable how frequently pain can in this way be lessened, or even banished altogether.

We may, indeed, go to yet more daring lengths in suggestion. We may, for instance, suggest that at such and such a time such and such will happen. It is needless to say that much discrimination is required in adopting this method, for we are here treading on dangerous

ground, and run the risk of being charged with illegitimate humbug. But we cannot afford wholly to ignore any therapeutic means at our command.

I recall the case of an exceedingly brilliant man in the incipient stage of melancholia. (I refer to his intellectual powers in order to emphasize the fact that often the most intellectual are the most credulous and impressionable.) This patient suffered much from insomnia, and it was imperative that he should sleep. I have already insisted upon the importance of getting into close touch with our patients, and this is especially needful with the nervous, and more particularly when there are grave mental symptoms. In this case I so far succeeded that the patient gave me his full confidence and implicitly obeyed all my directions. He also responded readily to some of my suggestions; the suggestion that he should sleep at night, however, failed. Now, here was a difficult position for the doctor to be placed in. He had to choose between letting the patient go on having sleepless nights with the risk of losing his reason, and adopting a method which might easily be mistaken for unmitigated humbug. I did not hesitate, but now suggested that he should go to sleep precisely at eleven o'clock, whereupon he begged that I would think of him at that hour as he felt sure it would help him, and I consented. The next day I was surprised to hear that he actually had gone to sleep at the hour named. I repeated the suggestion with the same success, and this went on for some days, when one morning I inadvertently let him know that I had not thought of him at the appointed time, and this broke the spell.

In cases like this the charlatan scores. He knows not of failure. He promises a cure to all alike, so that he can command the healing power of faith in every

case; and thus—as I have already insisted*—by faith alone he actually heals many to whom the genuine physician, with deeper knowledge but less audacity, would not feel justified in promising any cure at all.

Faith is, indeed, the chief remedy the quack deals in, backed up, it must be confessed, by a large amount of shrewd common-sense.

In a recent suggestive paper Dr. J. W. Springthorpe† bewails the neglect by the medical profession of psycho-therapeutics: "Few, indeed, are the medical practitioners who daily prescribe suggestion as well as diet, hygiene, and drugs. Yet the physician who makes even the minimum effort in this direction often does more for his patient than his more highly qualified confrère who makes none. To some, and they naturally the most successful, this endeavour comes without conscious search, and improves with experience, but in some measure it may be acquired by all, and no one who has become familiar with its powers will henceforward be content to remain without its constant aid." And, again, referring to the successes achieved by quacks, he points out how, by "utilizing the same potent curative agent, which the legitimate practitioner has neglected, and being further able to make from their very ignorance more extravagant promises and more insistent appeals, they unquestionably must produce far more frequently than is generally admitted by the profession many satisfactory results, and even many apparently astounding cures, which discredit medicine whilst they spread quackery. The profession has, apparently, yet to see

* See Chapter VIII.

† "The Position, Use, and Abuse of Mental Therapeutics," *Lancet*, November 18, 1905.

that equally exceptional results, and even better, would be well within its grasp if it would but recognize the real facts of the case. Meantime it is the apathy and neglect of so many medical men that is responsible for much of the success of quackery."

CHAPTER XIX

PSYCHO-THERAPEUTICS—*Continued*

INFLUENCE OF THE EMOTIONS.

We have now to consider another psycho-therapeutic method—to wit, the induction of emotional states favourable to the normal working of the organism.

From the therapeutic standpoint the emotions range themselves into those which stimulate and those which depress; consequently, in order to make use of them as therapeutic agents, the aim is to place the patient under conditions calculated to remove depressing emotions, and to excite emotions having a stimulating effect. As an instance of the latter we may take joy. Joy causes an exaltation of the vital activities: circulation, respiration, nutrition—all are accelerated. This makes for health, strengthening the barriers against disease, and enabling the organism the more readily to cast off disease if incurred. The happy and sanguine are less likely than those of opposite temperament to fall victims in an epidemic, and more likely to recover if attacked.

Fear may be taken as an instance of a depressing emotion. It causes a depression of all the bodily activities. Though the heart may beat more rapidly, the circulation becomes sluggish, and respiratory and nutritive activity falls. In this condition there is a lessening

of the resistance to disease and of recuperative power; indeed, as is well known, a person may actually *frighten* himself into an illness. Thus, he may develop pseudo-hydrophobia and many other morbid symptoms in various parts of the body solely by concentrating attention on those parts. Every physician of experience has seen many such cases. It has even happened that a person has died on a certain day simply from the rooted conviction that he was to die then—a most conclusive witness to the efficacy of suggestion.

A striking picture of the profound influence on the body of a depressing emotion is called up for us by the following well-known lines of Shakespeare. Here actual disease—manifestly chlorosis—is described as set up by disappointed love:

> "Duke. And what's her history?
> Vio. A blank, my lord. She never told her love,
> But let concealment, like a worm i' the bud,
> *Feed on her damask cheek*: she pined in thought;
> And *with a green and yellow* melancholy,
> She sat like Patience on a monument,
> Smiling at grief."

DEPRESSING EMOTIONS.

As the depressing emotions are a fruitful source of evil, it is well to be prepared, by a knowledge of the kind of evils they induce, to detect them on the first indication.

We all know how depressing emotions may disturb digestion. It is sometimes useful to bring this fact forcibly home to a patient. The following instance recorded by the late Dr. Harley impressed me much when I read it, and I have frequently mentioned it to patients.

Dr. Harley was lecturing to his class on the subject of bile, and was very anxious to secure a fresh specimen of the fluid. He had in his laboratory a dog with a biliary fistula, and about half an hour before the lecture he connected this fistula with a receptacle, so as to collect the bile as it accumulated. Having seen the flow started, the professor proceeded to run through his lecture-notes, but hardly had he begun when he heard a scuffling, and, looking round, he found the dog had attacked a chicken, a companion in distress. Harley sharply rebuked the animal and returned to his notes, but when, just before the lecture, he went to get his specimen of bile, he found only a few drops collected! His sharp words to the dog had entirely checked the flow.

But perhaps an even more striking instance of the influence of fear on the vital activities is one communicated to me by Dr. John Biernacki.* A toy-terrier of a peculiarly nervous disposition ran on to the railway, and only just escaped being killed by a passing train. Shortly after, it was observed that he emitted an unpleasant odour and, ever since, the mere taking him in the direction of the railway has sufficed to produce the same result, while if taken by train he is almost paralysed by fright, the odour then becoming very strong and persistent.

Among the diseases especially aggravated by depressing emotion I may mention heart disease. It is quite common for the heart to break down under such influence, the patient literally dying of a broken heart. He has, let us say, granular kidney; the left ventricle is drawing on its full reserve, and just able, under favouring

* See the writer's paper on "The Feelings," already referred to, *Journal of Mental Science*, April, 1900.

conditions, to sustain the normal circulation. Then comes a mental shock—a great grief, a business disaster, an outbreak of passion—and the balance is upset. The wasted kidneys which, so long as they were well flushed with blood impelled by a powerful left ventricle, were just able to keep the blood below the uræmic point, now no longer are able to do so; the urea output falls precipitately, and there is uræmia. In addition there occur the familiar evidences of failing circulation—engorgement of the lungs, anasarca, and the like. In such wise a depressing emotion may bring a man in comparatively good health to the very brink of death.

Cases of this kind might, if necessary, be cited *ad infinitum*. The lesson they teach is manifest: that the possibility of a patient's being subjected to influences tending to cause mental depression must be kept constantly before us, and that when we find such at work we must, as a first step, seek to remove them. It may be, *e.g.*, that a patient, by nature too much inclined to self-analysis, is becoming morbidly introspective under the pressure of certain religious tenets; or that he has some trouble gnawing at his heart, some skeleton in his cupboard—business anxieties, home worries, an occupation altogether unsuited to his disposition; or it may be merely that he is leading a dull, monotonous life. But be the cause what it may, we must do our best to remove it or get it removed.

Especially is it most necessary to guard against depressing influences in the sick-room. From that chamber everything calculated to depress should be rigorously excluded. I am reminded of a case which illustrates my meaning. I was asked to see a patient compelled to remain for several weeks in bed. I found everything about as wrong as it could well be. The

room was gloomy and sunless, the paper dark, the furniture heavy, and as the patient lay in bed, he looked directly on a photograph of a tombstone to the memory of a departed relative. The contemplation of such an object may bring comfort to some, but on many it would certainly exert a contrary effect. What I did was to have the patient transferred to the brightest room in the house, and to take care that the last object he saw at night and the first to meet his gaze in the morning was something more cheerful than a tombstone. I may add that a rapid improvement in his condition took place after this change.

It is a mere truism that the patient sick in bed should not be told anything calculated to depress, but, strange as it may appear, it is by no means always easy to secure this desideratum; stranger still, nurses are often great offenders in this respect. I have known a nurse pour into the ears of a sensitive and refined woman, too weak to resist, most gruesome details of other patients. It was doubtless from thoughtlessness on her part, and probably she had found other patients relish them, for, however it may be accounted for, nothing is more certain than that what is horrible and gruesome has a strange fascination for some minds. Nevertheless, it is well for a nurse to remember that it has not for all, and even when it has, it is not desirable that she should be its purveyor.

Sometimes harm may come from sheer tactlessness. Thus a nervous patient of mine was suffering from violent intercostal neuralgia, and was in deadly fear that he had malignant disease. He made good progress until one day he asked the nurse what her last patient was suffering from. She bluntly replied, "Cancer," and this started the old bogey again, and threw the patient back some weeks.

STIMULATING EMOTIONS.

To turn now to the stimulating emotions, which are of great therapeutic value and of which we took joy as the type. I use the term "stimulating" here advisedly, for these emotions act much in the same way as alcohol and similar stimulants, while possessing few, if any, of their injurious properties. They do not poison the tissues, and the worst that can be said of them is that when carried to excess they may be followed by reaction. We have, in fact, in them the most efficacious and harmless of all stimulants. What stimulant can compare with an exciting ride to hounds for those who love that truly British and very healthful pastime? and who has not felt the stimulation of good news, an evening in congenial society, a hearty laugh at a witty play, or reunion with long-absent friends?

Though much has been written on the subject of stimulants, I scarcely think that the true philosophic note has yet been struck. A stimulant is an agent which, while not supplying energy, is yet capable of rousing dormant activities and of unlocking stores of energy already existing—as in the case of the smart of the whip—and it is absolutely necessary to animal life that there shall be agents capable of rousing the dormant activities of the bioplasm. This statement is as true of the mental as of the physical side. Without stimulants consciousness itself would indeed be impossible. If we could suddenly arrest the action of all stimuli or stimulants (it is impossible to distinguish between the two) upon the sensory end-organs of a person—the optic, auditory, cutaneous, and other expanses—he would lapse into unconsciousness. And as regards the physical side, I have elsewhere argued, when discussing alcohol and

kindred stimulants, that the blood normally contains a number of chemical substances which exercise a stimulating effect upon the nervous system, and that herein lies the explanation of the widespread craving in man and beast for things stimulating.

The kind of stimulation I more particularly wish to discuss now is emotional stimulation—that, namely, which comes through certain emotions; and I would lay down this proposition—*that in order to health, all animals capable of any approach to an emotion need the stimulus of such emotion.* Even such torpid creatures as the snail and the tortoise are not exempt from the action of this law, for though the bare suggestion of any excitement in their lives may raise an incredulous smile, there can be no doubt but that they have their periods of emotional stimulation; and all the higher animals—*e.g.*, the birds and the mammals—are, in a state of nature, constantly under the influence of strong emotional excitation, which therefore, we cannot doubt, must stand in close relation with their physical and mental well-being, involving the corollary that the lack of them leads to evil consequences.

In order that the force of this may be more apparent, let us consider for a moment the kind of life led by primitive man, and by animals in a state of nature. Animals find, as primitive man found, in the struggle for existence—in the search for food, the avoidance of foes and other destructive agencies, and in the manifold activities entailed by the reproductive instinct—a never-ending source of emotional excitement. What time is not devoted to these ends, nor spent in sleep or dreamy rest, is occupied in play which, while it affords an outlet for redundant energy, stimulates healthy function.

And what is true of animals below man is also true of

man himself, more especially man living under primitive conditions. I doubt if it is realized how full of excitement the life of the savage is (for he still survives). The men spend a large portion of their time in the hunt, and the means they adopt for stalking, trapping, and otherwise circumventing their quarry, afford ample opportunity for the exercise of judgment, caution, patience, courage, and decision, with just that element of uncertainty and excitement which is so stimulating to the nervous system. The women, on the other hand, are busily occupied in the search for, and the preparation of, vegetable food and in the care of the young, occupations which at least keep their minds employed. And apart altogether from these stimulating activities entailed by the bare fact of living, savages find abundant excitement in their tribal and personal feuds, and in such desperate occupations as head-hunting and cannibalism, to say nothing of their weird dances, fantastic ceremonials, and wild orgies.

Thus in one way or another the savage is continually being stimulated through his emotions. Doubtless there have been, and there still are, aboriginal tribes leading, by reason of peculiar circumstances, peaceful, indolent lives devoid of great excitement. As I write, I am reminded of the happy-go-lucky, lazy Kanakas Mr. Frank T. Bullen came across in the Southern Seas during his famous cruise. But these cases are exceptional; life is not often capable of such simplification as in a sunny island of the South Pacific; and it is certain that if we trace the ancestry of civilized man back through primitive man, the ape-like man, and the man-like ape, to the simpler types of vertebrates—ay, and further still—we shall find that life throughout has been not only physically active but also permeated

by a stimulating emotionality, the two going hand in hand, being, in fact, mutually dependent the one on the other; and both are, in consequence, so wrought into the very warp and woof of man's nature that without them he fails in reaching the highest level of mental and physical development, and becomes, by reason of thwarted impulses, the victim of boredom, lassitude, and disease.

The need in man for an engrossing activity (which need becomes, in civilized man, the need for congenial work) and the need for emotional excitement—these are the two points I desire to press home here; and so important is their bearing on this question of stimulation that, in spite of their close interdependence, I will consider each separately for the sake of emphasis.

The Need for Activity.—First, then, regarding the necessity for work in some shape or form. Here we may take a lesson from the lower animals. All of them capable of conscious activity have to work to live. Every young bird and mammal, for instance, directly it has left its parent, has to shift for itself, be self-dependent and self-reliant; it is not spoon-fed all its life, nor has it the misfortune to be born with ten thousand a year (or its equivalent in the animal world): it has to work, and in that work finds both health and happiness.

And how energetically animals have to work in order to keep themselves alive, a moment's consideration will suffice to discover. Take, for example, the London sparrow—though he has a comparatively easy time of it, this little city arab, picking up his living in the midst of a crowded population. He has always, week in, week out, summer and winter, good times and bad, to provide himself with his daily food; not one morsel of it ever comes to him unsought. If he wants his morning

tub, it must be gone after, searched for; there is no hot-and-cold water supply laid on for *him*. Probably he has the wants of a family to consider as well as his own for some part of the year, and always he has to keep a sharp look out against that tiger of the roofs among which he dwells—the ubiquitous cat. And, as though all this were not enough, there is his versatile enemy, the small boy, who, grown a man, is scarcely less inimical to him, for he may be put to various economic uses besides that of being painted to look like a canary. Clearly, all this entails constant activity and watchfulness; if he fails in them he is lost. As a consequence, his resourcefulness is developed to the utmost; he has no unsatisfied energies craving outlet and making him wretched; as his merry chirp testifies, he does not suffer from boredom; indeed, any animal that abandoned itself to boredom would very soon find itself behindhand in the struggle for existence, and would promptly be wiped out by more alert and enterprising competitors. The struggle for existence is the condition of his well-being. Wherever, in the wild state or the state of nature, things are made easy for an animal so that it has not to struggle severely for bare life, we find a falling away, a retrogression, as is so well illustrated in the case of many parasites. Let those who are inclined to look upon the great law of the animal world as ruthless in its working, seeing only the "red tooth and claw," mark this well.

The Need for Emotional Excitement.—Secondly, I want to keep in view the fact that man, by virtue of an ancestry reaching back into the far past, the individual members whereof led energetic and exciting lives, craves the stimulus of emotional excitement. This fact enables us to explain several of man's mental traits. In the case of civilized man the struggle for existence

does not, speaking generally, entail the same amount of excitement as in the case of primitive man and the wild animals. So far as it is a conscious struggle, it consists for the most part in earning money, and the ways of earning money, though they may, as in our own and other professions or in any occupation where the individual has to act on his own initiative, be full of interest and stimulus, are, unhappily, but too often dull, wearisome, and monotonous in the extreme. Witness the daily routine of many factory hands, labourers, shop assistants, clerks, policemen, and the like. But there are in civilized communities many who do not take any part in the struggle for existence, who do not have to work to live. Such are those who inherit wealth, those who, having gained a competence, retire from work, and a large number of the women-folk of the upper and middle classes.

In respect of these two classes, therefore—those who do not work for their living, and those who, while working for it, yet follow monotonous and unexciting occupations—the civilized man is lacking in the emotional excitement which belonged to his primitive ancestor, which he himself craves by nature, and deprived of which he suffers both in mind and body. Do we not over and over again see people pining for want of something to do, something that is to absorb their interest, use up their energy, rouse their enthusiasm, and make them glow with that physiological excitement for which we all, whether we know it or not, normally crave, and are bound to crave?

The modern man, being thus insufficiently supplied by the struggle for existence with emotional stimulus, has to seek it in other directions, and we find the deep-rooted instinct for excitement asserting itself in many and varied

ways—in the love of sport, especially of shooting and hunting, and of dangerous adventure of all kinds, the danger being a most important element, since in it chiefly lies the stimulus craved. We can in this way also, I believe, explain the strange gambling instinct observed in civilized man. This instinct—for it is so universal that it can be described as such—cannot be explained simply by the greed of gain; the element of hazard enters into it, giving zest and flavour to the transaction, as it does to contests of all kinds, apart from any gambling—*e.g.*, horse-racing, foot-racing, boat-racing, wrestling, bull-fighting, prize-fighting, cock-fighting, in each of which we get both the excitement attendant on the struggle for victory and the uncertainty as to the winner. The excitement of watching a contest in which one is keenly interested cannot well be surpassed in intensity, as all of us can testify who have witnessed the final ties for the Inter-hospital Football Challenge Cup. As for our national sport, horse-racing, I am convinced that far more good comes of it than evil; and I have no sympathy with those who would banish it from our midst as an evil thing. Let anyone witness the joyous emotion of the thousands who flock to a race like the Derby, and he will see a practical comment on my meaning.

The craving for excitement also finds vent among civilized communities through the fighting instinct. His fighting propensities come from man's far-off ancestors, and date back far beyond the pre-vertebrate era. Fighting is certainly a sufficiently stimulating occupation, and so intensely do some crave it that they will go out of their way to get up a "row" for the mere pleasure of the fight, in proof of which many amusing tales, most of which concern our genial neighbours on the other side

of St. George's Channel, might be cited. Among the uncultured, fighting usually resolves itself into a contest of brute force; but there are other kinds—intellectual kinds—of fighting, quite as, or even more, stimulating: political fighting, forensic fighting, fighting theological, and there are some who are never so happy as when engaged in one or the other, herein finding their necessary stimulus.

The readiness with which, owing to this strong instinct, even a civilized nation will be seized with war-fever was but lately demonstrated among us in a remarkable way. It has been said that wars are generally forced upon peoples by their rulers, and that were the people left to themselves there would be perpetual peace. But no representative Government would venture upon a war of any magnitude without popular support—at any rate in these days—and it is certain that many wars have been the outcome of popular sentiment.

The migration of country people to the towns, though of course mainly determined by economic necessities, is partly due to the fact that town life with its bustle and stir holds out numberless excitements, whereas, in the country, life for the poor man means stagnation. For this reason the poor, though they may exchange a beautiful part of the country for a London slum where they are caged up in small, dingy, stuffy rooms, rarely want to go back, in spite of the fact that they suffer in health and undergo physical degeneration. We can only explain their choice on the supposition that town life provides the excitement which is wanting in the country. By those, however, who can obtain the necessary excitement in the shape of hunting, shooting, and the like, the want is not felt, and to many of these the country is more attractive than the town.

Again, the craving of man for some stimulus to raise him out of the torpor into which he is otherwise apt to sink is shown by the readiness with which he will seize upon any incident likely to afford excitement. Any trifle suffices to attract a crowd. If a horse but falls down in the street one immediately collects, though each member of it has seen the same thing over and over again. It is said that a man once wagered that he would collect a vast multitude in Trafalgar Square by saying two words only, and that he won his wager. He simply stood by old Northumberland House, and, pointing to the lion at the top, said "It moves." People are, indeed, glad of the slightest excuse to work up excitement. Look how they turn out in their thousands to see a pageant of any kind, from a poor man's funeral to a coronation procession. A shrewd observer once told me that, were he a ruler, he would take care to provide his people with plenty of spectacular excitement, did much of it merely take the shape of occasionally marching a regiment of soldiers through the streets. In periods of political disaffection this principle has been well recognized and acted upon, from the time of the Romans—and I doubt not much further back still—onwards.

The same strong desire for excitement is displayed in the love of civilized peoples for dancing, the theatre, and games of all sorts, and in the ever-changing amusements of the wealthy. Since most amusements tend by repetition to cloy, new ones have continually to be invented to provide the poignancy of novelty. Here we get another stimulus—surprise; and I am tempted, at the risk of a digression, to observe that many other mental phenomena may be explained on the same lines. Is not curiosity the desire to find out something which is unknown, and which may *excite* by surprise? The

relish for scandal, again, has surely a somewhat similar origin. The tendency to exaggeration also is born of the desire for excitement. Certain primitive types of mind will not only exaggerate, but will invent the most extraordinary tales in order to work up excitement. And does not the desire for excitement help to explain the sweetness of forbidden fruit, the fascination of oratory, the love of controversy, the charm of wit and humour?

Some people are endowed with a positive passion for scheming, which may be nobly or ignobly turned to account in politics, diplomacy, business enterprise, as well as in the smaller affairs of life; but in whatever channel it is directed, it constitutes a most effective stimulus. Engrossing occupations of any kind are highly stimulating, as witness the disastrous results which sometimes follow on the giving up of business. I have seen a man go mad from relinquishing one of two businesses that he managed. The leisure he thus obtained gave him the opportunity to dwell upon certain unhappy incidents in his early life, and his mind became so unhinged that he had to be put under restraint.

As showing the stimulating influence of engrossing occupation, I may refer to the case of a patient who consulted me for exhaustion and "nerves." He was manifestly in a wretched state of health—pale, listless, and altogether out of humour with himself and the world; said he was tired of making money, and thought he would settle on a small farm and look after pigs and poultry. I gave him the best advice I could, and prescribed a tonic. A week later he came again, showing little or no improvement. I repeated the tonic, and saw him again after another week. This time I observed an extraordinary change in him; he said he felt quite well,

and, indeed, he looked it. It appeared that shortly after his last visit to me he strolled down quite casually to a meeting of the shareholders of a company in which he had a small interest, not, however, intending to take any part in the proceedings. Had he prepared a speech, he would, so he assured me, probably have broken down in the delivery of it. As it was, moved by a sudden impulse, after listening to the chairman's statement, he got up and spoke so much to the point and with such a complete mastery of the subject, that, unknown man though he was and but a small shareholder, he was subsequently invited to undertake the entire management of the business. He accepted the offer, and under the stimulus of the work became a changed man.

I have said that the wealthy are continually inventing new forms of amusement. Not having what we may call the normal, or natural, stimulus of necessary work, they are driven, unless they take up some employment for the love of it, to seek excitement in a constant round of pleasure, and, nothing hindering, they get to spend their lives in a ceaseless quest of new sensations. As a result, they become so dependent on this artificial stimulation that they fret and pine without it; and since eventually all spurious excitements must pall, since all artificial stimulants cease at length to stimulate, or do so with ever-diminishing force, while the craving, intensified by gratification, remains in all its old force, it is by no means an uncommon thing to find among these devotees of pleasure some who drift into actual ill-health, bodily as well as mental. For the demand for emotional excitement is not to be trifled with; it is a physiological demand, the expression of a need inherent in man's nature, and as such is bound to make itself felt

whether, as in some lives, the error lies in defect, or, as in others in excess, in the supply of excitement.

I would here observe that natures differ much in their emotional needs. In respect of the need for emotional stimulation there are two extremes—at the one extreme are those who seem to get on well while leading peaceful, uneventful lives; at the other, those who mentally pine away and become discontented and unsatisfied if their days are not full of activity and eventfulness, and rich in emotional experiences. Thus we find society—by which term I would indicate those whose circumstances allow them freedom of choice—ranging itself into two camps. In the one there are the votaries of pleasure, who refuse to take life seriously. Their motto is, "Eat, drink, and be merry, for to-morrow we die." They have no searchings of heart, think little of the past, less of the future, and just live in and for the present, abandoning themselves whole-heartedly to gaiety and frivolity. In the other camp are those who, reversing all this, take life too seriously, incline to introspection, and regard dancing, theatre-going, and the like frivolities with contempt, if not with horror.

These differences are largely temperamental, and depend in great measure upon peculiarities of blood-composition. A little more or less of this or that hormone may make all the difference between the active sanguine and the passive lymphatic temperament.

A life at each of the above two extremes brings its evils, and here, as elsewhere, well-living lies in the golden mean. Those who glut themselves with excitement suffer the inevitable reaction from all excesses; those who lead a life of leaden dulness may drift into a state of melancholia. Of the latter, here is an example from my note-book:

A woman, aged forty, wife of a country clergyman; tall, spare, grey, severely religious, and introspective. Every hour of the day is mapped out for the performance of some duty—holding classes, teaching her children, studying theology with her husband, criticizing his sermons, and the like. She sees little society; such people as she associates with intimately are much of her own type, and the most exciting event in their social intercourse is, let us say, an occasional tea-party, beginning and ending with prayers. This woman, when she consulted me, was steadily drifting into melancholia; she had attacks of profound depression, and already was beginning to get fixed ideas. There can be little doubt that her condition was very largely the outcome of her surroundings: she was leading a life altogether too dull, monotonous, and serious. She needed the stimulus afforded by the stimulating emotions—bright society, change of scene, the diversion of her thoughts from their well-worn ruts; and when she was treated on these lines her health improved in the most marked way.

It will be seen from the foregoing that mankind craves mental stimulus. Just, in fact, as his physical nature requires, besides nutrient material, a due proportion of chemical stimulants, so on his mental side he needs, not only food for his intellect—*i.e.*, ideas to serve as material for cold, dispassionate reasoning—but a constant stimulation of his emotional nature by what we may term "mental stimuli." Without both these kinds of stimuli he, in common with the lower animals, very soon lapses into mental and physical inertia.

The animal organism is in very truth *kept going* by stimuli—physical, chemical, and mental; they are neces-

sary to its active existence. Block up the avenues of sense, and the individual falls asleep; take away the chemical stimuli* from his blood, and he drifts into idiocy; remove all forms of mental stimuli, and he becomes inert, listless, and in the end demented.

* *E.g.*, the hormone yielded by the thyroid gland.

CHAPTER XX

PSYCHO-THERAPEUTICS—*Continued*

THE THERAPEUTICS OF MENTAL STIMULATION.

We have now to deal more particularly with the therapeutics of mental stimulation.

Work.—Inasmuch as work is natural to man and, when of a congenial kind and performed under sanitary conditions, conducive to health and happiness, we should impress upon our leisured patients the advantage—nay, the imperative need—of having something definite to do. We should say to them: "All animals, save the most rudimentary and the most degraded types, spend active lives in the search for food, avoidance of foes, etc. Man is no exception, and if, under no compulsion to strike out and shift for himself, he neglects to find the equivalent of compulsory work, not only does he not justify his existence but he does not develop properly; he fails to bring out the best that is in him, and is moreover apt to suffer in mental and bodily health."

For it is the struggle for existence, the pinch of necessity, that develops our powers. Take a case like the following: A girl who had led a peaceful, uneventful life in the country, married at the age of twenty a man of very marked personality, a personality so strong that

it entirely dominated and absorbed hers; she followed him in all things, and allowed him to think and act for her until she became his mere echo, with no individuality, no initiative, no ideas of her own—a mere amiable cipher in the household. In a room full of people she would sit passive and self-effaced, not opening her lips unless spoken to, and then only to utter some commonplace in a listless sort of way. No wonder that the general verdict came to be that "there was nothing whatever in her," nor that she was the last person in the world suspected of possessing great latent capacity. Nevertheless, events proved that she had it. Her husband died, leaving her penniless, and she was compelled to support herself. Without any help and entirely on her own initiative, she started a business concern on wholly original lines, and made it not only a success but a brilliant one, while she herself became completely transformed from the meek, timid, and dependent wife to a bustling, energetic woman of business.

Among those who suffer from lack of occupation, I may especially single out the large army of leisured young women of the upper and middle classes. Their brothers have generally some employment, the majority having to earn their living and even those with means, as a rule, taking up some calling—either they enter the services or the Church or they take up politics as a career. But the daughters of the family stay at home, and though some (and happily their number is increasing under the influence of more enlightened views as to the mental and physical needs of woman) actually take up regular employment or get interested in engrossing pursuits, the rest, and they are still many, lead idle, aimless, and therefore discontented lives. I venture to say that there are thousands thus situated, conscious—

and therein lies the misery of it—that their lives are incomplete. They are discontented because they are transgressing that universal law which decrees that the human animal, like every other, shall work. They may have health and refinement, for a time they all have youth, and they may be surrounded by every luxury—yet they are discontented; it all palls. The fact is, every woman, no matter how high her social position, should have some employment. As her poet sister has said:

> "Get leave to work
> In this world—'tis the best you get at all;
> Be sure 'tis better than what you work to get."

The physician should have as much to say in this matter as the priest, for idleness does more than lead to moral degeneracy; it breeds disease as well.

Another class suffering from lack of occupation comprises those who, after a life of work (and especially when that work has engrossed their full time and energies) having made their fortune, retire. We often find such men looking forward during their business life to the days when they can rest on their oars and drift along the stream of a calm, peaceful, and, as they anticipate, happy existence. Vain hope! The time comes and brings, not happiness and content, but boredom and malaise. How often it happens that retirement from active work is the signal for the appearance of a number of symptoms which before were either kept under or passed unnoticed. This is especially liable to be the case with the man of limited resources, above all, with the man who has no interests beyond his business, whose "shop was all [his] house," as Browning puts it. With the resourceful man, the man with literary or artistic taste, or with an absorbing hobby, the case

is different—a further confirmation, if confirmation were needed, of the desirability of all-round development.

I may quote in this connexion the case of a nervous patient, aged thirty-three, who had set his heart on shortly retiring from business, and this in spite of the fact that his financial position would be greatly improved by keeping in it a few years longer. I asked him if he had well considered the wisdom of the step, pointing out how frequently men who severed themselves from active work went back to it again through sheer ennui. He assured me, however, that there was no danger of this in his case, for he had a passion for botanizing and could always occupy himself in the pursuit of it; he was never so happy as when wandering alone in the country looking for rare specimens. Now, when a man has a hobby of this kind in which he can indulge without fear of satiety, we need have little hesitation in sanctioning his retirement from money-making.

When, then, we are asked by a patient whether he shall give up his work, we must weigh well the possibility of his deriving more harm than good from the step. It is undoubtedly often far better—and by better I mean here happier for the individual—to die in harness than to drag out in vacuous, listless days an existence which has become barren, monotonous, and without aim.

So much for the advantages attaching to occupation when it is congenial; but there are occupations and occupations: some are essentially absorbing and interesting; others necessarily dull and monotonous; others, again, are repugnant to all but the coarsest; and some are actually unhealthy and even deadly. (We are, however, only concerned here with the mental effects.)

Happily, owing to that infinite diversity in the temperament and inclination of different individuals which

always obtains among mixed races, suitable persons can generally be found for all the multitudinous forms of work necessitated by our complex social organization with its infinite division of labour. Thus, as regards the professions, we meet with those who seem specially, as we say, "cut out for"—indeed, have an actual passion for—engineering, surgery, the bar, the Church, soldiering, teaching, or what not. And so in regard to all the other callings. A goodly number of people take kindly to uninteresting and monotonous occupations, such as those of policeman and postman, being, fortunately for themselves, not endowed with a too vivid imagination. Others there are who find such gruesome occupations as grave-digging, "undertaking," slaughtering—nay, even the execution of their fellows, not uncongenial, for I understand that when the post of public hangman is advertised there are many hundreds of eager applicants for it. Those who adopt these callings are for the most part coarse-grained, but such is the force of custom that even sensitive natures can get accustomed to what one would fancy must, in the nature of things, be very depressing. I may instance the case of a highly nervous and sensitive man who consulted me for organist's cramp: he played the organ at the burial services in a large cemetery—a sufficiently depressing occupation, one would think; yet, though he lived in a very vale of tears, he did not complain of the depressing accompaniments of his calling, but solely of his liability to make mistakes and break down in the service.

Inasmuch, then, as different individuals are by nature adapted for different callings, no effort should be spared to fit each to his proper one: the right calling may mean—in nine cases out of ten does mean—a life of health, happiness, and success; the wrong, disease,

misery, failure. Unhappily, circumstances cannot always be so controlled that each shall follow the kind of life to which he is best suited; for most, indeed, there is probably no choice. Their career is settled for them.

Volumes might be written on this subject, but I must not pursue it further. Yet it is not one that we can ignore altogether, inasmuch as the physician is often consulted about the occupations of his patients, and it is of the utmost importance for him to get them to change these where possible, if they should be mentally depressing. Unfortunately, however, circumstances are often too strong for us, and it is not possible.

Hobbies.—Besides the stimulus of necessary work, the physician can call to his aid such mental stimulants as are afforded by a hobby (*i.e.*, work undertaken purely for the sake of the interest, pleasure, and amusement it affords), cheerful company, the various kinds of sport, games, change of scene, and the like.

It is well that every one should have a hobby of some sort, and we may often do our patients, especially the nervous ones, much good by getting them to cultivate one. Some years ago a nervous and self-concentrated young woman was brought to me complaining of "flushing of the nose." She had just sufficient means to be independent of work, and was undoubtedly suffering from lack of any definite occupation or aim in life. It so happened that just before I saw her I had heard the zither played at a public entertainment, and was much struck with the beauty of it. I advised her, quite casually, to take up the study of the instrument, which to my surprise I may say, she did, and she has practised at it from two to three hours daily ever since to such good purpose that she is now seeking to become a professional. Now, this patient got quite well very

soon after she came to me, and there can be little doubt that it was essentially a case of *zither cure*, for beyond a short treatment by bromide she had no other.

It should be noticed that from the therapeutic standpoint a hobby is valuable in proportion as it takes a man out of himself—in proportion, that is to say, as it diverts the thoughts from within outwards. It is in the case of those who are unduly introspective that it is especially needful to focus the attention on things objective rather than subjective. Of all occupations for engaging the interest and causing self-forgetfulness, I would place the mechanical ones first. In them it is concrete realities which can be handled, weighed, measured, that we are dealing with, and the mind is occupied with devising ways and means of bringing about definite physical results. From this point of view alone, I consider that a movement like that which has resulted in the Arts and Crafts Exhibitions of recent years is deserving of cordial support, reviving, as it must, an interest in good workmanship in the various branches of handicraft, and taking us back, perhaps, within sight of a return to the days when the masters of handicrafts were not only skilled workmen but artists too, delighting in their creations and lavishing on them taste, ingenuity, and a patient, loving care that has made them the despair of modern machine-aided imitators. Get a patient to take up some one branch of hand-work—book-binding, repoussé work in copper or brass, enamelling—I care not what it is so long as he works at it with painstaking sincerity—and I will guarantee that while engaged in it he will rarely be troubled with morbid symptoms. Carpentering and mechanical engineering constitute most useful and absorbing hobbies. The liking for the latter may amount to a veritable passion, and often

shows itself in quite early years. I could relate many instances. One of the most remarkable is that of a medical student who having spent six years in making a model of a railway locomotive, still needed two more to finish it; he had all this time worked two hours every day before breakfast on the model, not excepting the days on which his examinations were held!

Social Intercourse.—There are few forms of emotional stimulation more calculated to promote health than cheerful company. We all know how it aids digestion. A friend of mine always gets indigestion when he dines by himself, and has in consequence to be very careful what he eats then. When he dines in company he can indulge much more freely with impunity.

Again, we may often see a person moping indoors with headache and general malaise. A visitor calls: she (for it is generally a woman) engages in animated conversation, her face brightens, and when afterwards asked how her headache is, she will say she has "forgotten all about it." And, indeed, there are many nervous, habitually-ailing people, whose only hope of escape from their symptoms lies in "forgetting" themselves amid the distractions of agreeable society and engrossing pursuits. It is much on this principle that we hear it said "I have no time to be ill." It is not merely that a person is by social intercourse taken out of himself; agreeable company does more than this: it exercises a profound influence upon the organism. Of all kinds of conversation, that which promotes laughter is the most stimulating, and it has been well said that the man who makes us laugh is a public benefactor.

This stimulating effect of conversation was recognized by Lord Beaconsfield, for has he not told us that a man may be "inebriated by the exuberance of his own

verbosity"? And certainly some people get very excited when talking, especially if the subject is politics or scandal.

Reading, Singing, Dancing.—Reading, again, may be stimulating, but in devising a plan of treatment it is generally advisable to suggest to the patient the kind of literature he should read. I have often had to interdict serious, difficult, or introspective reading in favour of books of a lighter and brighter kind. Singing is another very healthy occupation.* We have only to look at our public singers to see the truth of this, though in their case it is not merely the act of singing which is health-giving, but also the stir and variety incidental to the life of the professional singer. It is probably for the same reason that actors who take due care of themselves enjoy such good health. It is not possible to individualize here all the various amusements which benefit the body through the mind; nor is it needful. I must not, however, omit to mention the stimulating effects of dancing. It is well known that primitive peoples work themselves up into a very frenzy with their war- and festival-dances.

Let every one, then, provide himself with healthful mental stimuli; let him have occupation; let him be ambitious—have some goal to win, some difficulty to be overcome (for, as observed in an earlier chapter, true happiness lies in the effort rather than the achievement); let him have outdoor amusements and hobbies innumerable. If he has all these he will be little likely to get bored or to crave for morbid emotional excitement, and so much the less disposed to desire the spurious stimulus of alcohol.

* See further on this subject the writer's work, "Respiratory Exercises in the Treatment of Disease."

Hope.—I now come to consider more particularly the therapeutics of *hope*. When a patient is ill, we not only do our utmost to banish depressing emotions and encourage cheerfulness, but we seek to engender and sustain the specific element of hope. This is so necessary, both as regards the feelings of the patient and also the prospects of his recovery, that we should always—to the patient, at least—err, if at all, on the side of being over-sanguine; and even in the case of the friends I, personally, am disposed to do this, partly to save them pain, but also because they are better able to be bright and cheerful and to infect the patient with cheeriness when buoyed up by hope than when paralysed by despair.

All this may seem self-evident, and yet it is certain that physicians do not always act on these lines. Some are well known for their disposition to take a gloomy outlook and to kill off, in anticipation, or doom to chronic invalidism, numbers of patients who eventually make a perfect recovery. This is to a large extent a matter of temperament, and results from a tendency to take a jaundiced view of things in general, but it also results from lack of sympathy—from failing to realize how much a bad prognosis may mean to the patient and his friends. Probably, too, most doctors of this type are so constituted that they would themselves like to know the worst, and they merely fall into that common but fatal error of judging others by themselves. Keeping in view the necessity of sustaining hope in our patients, we are, I hold, usually justified in acting on the principle that "where there is life there is hope." When, however, we are sure that the disease is incurable or fatal, what shall we say? The truth, of course; but it is by no means necessary that it should always be the

whole truth. If we are not asked, we need not refer to the prognosis at all; if we are, our position becomes more difficult, and much will depend upon the idiosyncrasy of the patient, which we should seek to ascertain. Some like to know the worst; they will say: "Tell me the worst, doctor; I can bear it." Others prefer to be kept in ignorance of the truth, and from these I have no hesitation in withholding it. But, in any case, much may be done to soften the fatal verdict; there should be no brutal frankness; we must not fell with a bludgeon; suddenly to spring upon an unsuspecting patient the verdict of some fell disease, like cancer, is wellnigh criminal.

And in seeking to mitigate the truth it is well to be careful in the choice of words. It may seem a trivial matter, but malignant disease does not sound so dire a thing as cancer; spinal disease as locomotor ataxy; kidney trouble as Bright's disease; opacity of the lens as cataract; dilatation of a bloodvessel as aneurism.

We must be equally cautious in giving our diagnosis, remembering that patients, especially the educated ones, when listening to the physician's verdict hang upon his every word, and that an incautious expression may start a doubt or fear which will be burnt in upon the brain. My teacher, Matthews Duncan, was wont to wax wrathful at the fashion which prevailed among gynæcologists a generation ago of telling every woman who had slight superficial ulceration of the cervix uteri that she had ulceration of the womb. A woman would not be likely to forget those words, and thus her attention would for an indefinite time be concentrated upon a part of her body where no disease existed, and her mind would be apt to conjure up all sorts of imaginary troubles.

I have frequently known harm to come from the

physician's thoughtlessly directing the patient's attention to some very doubtful trouble. I give a single instance:

A medical man develops at the age of seventy-five his first attack of bronchitis. When convalescent he goes to a health resort, where the doctor, an enthusiastic disciple of the Nauheim methods, elaborately percusses out his heart, takes a tracing of its outline, and tells him it is dilated. Seeing him soon after, it was quite in vain that I pointed out to him that he had no symptoms whatever of dilated heart, and for months—nay, for more than a year—he was haunted by the idea that he had serious heart disease, the belief not only keeping him in misery, but seriously retarding his progress. He is now, happily, at the age of seventy-eight, perfectly well.

In cases of chronic incurable disease—*e.g.*, locomotor ataxy and granular kidney—there is not necessarily any great difficulty in speaking to the patient about his future. Persons suffering from these diseases may live for years, and lead useful, enjoyable lives, so that we are often justified in speaking in quite hopeful terms regarding them. A man of forty, in the initial stage of tabes dorsalis, consulted me about six years ago. He told me his employers had offered him the management of a very important branch of their business, which would naturally increase his income, but also his responsibility: would I advise him to accept the offer? He was evidently a most capable man, and I emphatically advised acceptance. He followed my advice, has been most successful in his new undertaking, and is this day very little worse than he was six years ago.

In our endeavour to get the patient to look on the bright side of things, it is well to have in mind and be able to cite, some apposite case which, though it appeared hopeless, nevertheless recovered. This always

proves a source of comfort. Thus, suppose a case of hemiplegia to come before me, in which there seems a prospect of fairly good recovery, I might cite such a case as the following: Twelve years ago a medical man, aged fifty, had a stroke, probably from hæmorrhage, which left him hemiplegic. Seeing him some months afterwards, and while the paralysis was still marked, I confess that when he told me it was his intention to read for a certain examination, it seemed to me that it would be more in accordance with the fitness of things if he settled his earthly affairs, and undertook a preparation of a more serious kind. Well, I lost sight of him until a few weeks ago when I met him in the street looking the picture of health, and I could not, after a critical scrutiny, detect even the slightest suspicion of a limp. The last twelve years had been uninterruptedly and increasingly successful.

Again, in a case of heart disease we might encourage our patient by recounting an instance like the following: A stout woman, aged sixty-five, consulted me five years ago for failing heart. She was short of breath, and had for some time suffered from swollen ankles and legs; the heart was enlarged and there was a mitral systolic murmur. She gave the following history: When she was twenty years old—*i.e.*, forty-five years before—she had rheumatic fever, and her doctor told her the valves of her heart were attacked. Evidently the mitral trouble dated from that time. Moreover, it is pretty certain that the pericardium was also affected, inasmuch as she remembers suffering great pain in the cardiac region and being blistered there for it. This patient so far improved under treatment that the breathlessness and anasarca disappeared, and now at seventy she regards herself as quite well.

In giving a prognosis we should also bear in mind how many patients recover after they have been given up. It is not at all uncommon to hear a person, in speaking of a past illness, say "The doctor gave me up"; and we are all familiar with invalids who—according to their friends, at least—have been dying for years, yet nevertheless go on living and spend, it may be, useful and not unenjoyable lives.

More especially must we be careful not to give a gloomy prognosis in the case of the aged. Old age, indeed, increases the gravity of all diseases, but old people not unfrequently recover from serious disease in a truly remarkable way.

One word more regarding the desirability of saving the patient pain when giving an opinion on his case. I hold that whenever we are able to remove suspense we should do so as soon as possible, and not, as I have observed to be the practice with some physicians, delay to deliver a favourable judgment. Suppose, for instance, a patient comes to us suspecting that he is suffering from a terrible disease. We go through a slow and laborious examination, during the whole of which he must suffer agonies of suspense: why wait till the end before giving a verdict, if *quite* early in the examination we are satisfied that there is no cause for alarm? If, therefore, a patient comes to me in the belief that he has grave heart disease, and I notice that the apex is beating slowly, steadily, and well within the nipple line, and that his general aspect altogether negatives the view that any serious heart disease is present, I say to him without further ado: "You may set your mind at rest; I can tell you this at once—there is nothing seriously the matter with your heart." I then proceed to make a detailed examination, and even if I find at the end of it

that the heart is not entirely sound, I have at least prevented some moments of very painful suspense. But in almost all cases when the heart is sound it takes very little time to find out the fact, and we are in a position to remove the suspense very soon. And, similarly, in regard to many other suspected diseases, we can set the patient's mind at rest almost at once; and whenever we can, then most assuredly we should.

Let us never forget that when our opinion is sought concerning a suspected fatal disease, the patient is much in the position of a prisoner being tried for his life. When the jury have retired to consider the verdict, would it be a matter of indifference to us, if placed in the position of the prisoner at the bar, whether they remained absent two minutes or two hours?

CHAPTER XXI

THE THERAPEUTICS OF FRESH AIR

MAN AN OPEN-AIR ANIMAL.

OTHER things being equal, the man who spends much of his time out of doors will enjoy better health and live longer than he who lives chiefly within four walls. The more sunlight and fresh air a man can get the better, and consequently an open-air life, securing as it does the maximum of each, suits him best. Nor is this matter of surprise when we consider that our ancestors during long æons lived in the open, taking to cover only under special stress. Thus it has come about that pure air and sunlight are as much man's natural elements as was water the native element of his gill-breathing progenitor, and that he thrives best under conditions which afford them unstintedly, while he grows pale and sickly when they are withheld.

I once came across a woman in the Scottish Highlands 102 years old. She had lived all her life in a cottage on a wide, wind-swept moor, whence there stretched mile upon mile of open country away to the distant mountains, with scarce a single habitation in view. She was still hale and hearty, and had until quite recently been working in a peat-moss. It was impossible to doubt that to the pure air of the moors she owed her length of years,

and that death would long since have claimed her had it been her destiny to lead a life of confinement. I may further cite the case of a nonagenarian with whom I have for some years been acquainted, and who in many respects seems as young as the average man of fifty-five or sixty. Now, his occupation used to be that of head-gardener, one, namely, necessitating an outdoor life without great physical toil—an ideal life from the health point of view; and there can be no doubt that his extraordinary youthfulness is in great measure attributable to this circumstance.*

I have said that man's ancestors lived in the open. Early man sought shelter from weather, floods, or foes, in caves and such-like places; at a later stage he built himself dwellings. But even then these immediate ancestors of civilized man spent only a very small part of their time under shelter, and in this connexion it has to be remembered that, according to all indications, man first emerged from the brute in some warm part of the earth, where an open-air existence was practicable. Thus he was, like the gipsies of to-day, essentially a child of Nature.

At the present time, and in civilized countries, it is only the agriculturist, more especially the agricultural labourer, that we still find living chiefly in the open air, and thereby escaping the evils which would otherwise accrue from sleeping in the stuffy cottage which is usually his home. But with the increasing development of large towns even this one remaining link with the free, open-air life of the past is being broken. Towns, with their stir and excitement and their offer of work of all kinds, tend more and more to attract men from the

* Some eight years ago I showed this old man at a medical society, and the majority present judged him to be a little over fifty.

soil, and, once become town-dwellers, their occupations generally compel them to live indoors, or, if not actually within four walls, within the purlieus of factories and the like, and under conditions very far removed from those of the old free life, under the open sky, of their ancestors in the remote past. Many of them think it much if they manage to get into the open air for half an hour daily, and even the leisured inhabitants of towns we find spending but a small part of the day out of doors.

Hence, with the growth of towns and the depletion of the agricultural districts, man has come to live more and more in confinement, and as a consequence his health has deteriorated. Doubtless he is undergoing a process of adaptation to this mode of life, and there seems to be no reason why he should not eventually become adapted even to life in the slums by the elimination, through successive generations, of those least able to resist its baneful effects. This assumption is by no means so far-fetched as some may suppose. Civilized man can keep healthy in towns where the primitive savage would die, and among the civilized the Jews are better adapted than men of other nationalities to life in towns—are, indeed, capable of tolerating the squalid life of the Ghetto with comparative impunity—owing doubtless to the fact that they have for so long a time been essentially a town-bred people.

It may be argued that man, being by nature a creature of fresh air and sunlight, is quite incapable of becoming so far modified as to thrive in the dark, unsavoury regions of the slums: yet this is by no means impossible. Many mammals whose ancestors were quite as dependent upon sunlight and pure air as are we ourselves now thrive in places where the sun never shines nor the winds of heaven blow. Take the mouse and the rat, mammals

like ourselves. Well, it will be conceded that in the matter of fresh air and light the habitation of the common house-mouse leaves, from our point of view, much to be desired; nor should we regard a London sewer—that happy hunting-ground of the rat—as a paradise of sanitary perfection. Yet both these animals flourish exceedingly well under these, to us, wholly uninviting conditions: they have gradually become adapted to them. I must not, of course, be supposed to be arguing that nothing should be done to improve the condition of our urban poor; I merely wish to insist that the adverse conditions under which many of them live, though causing individual damage, lead, not to *racial* degeneration, but rather to racial adaptation.* Slum life unmistakably entails *individual* physical degeneration, and being moreover little conducive to a high morality, it behoves us with all possible speed to banish its haunts from our midst.

The physical evils of slum life arise chiefly from lack of fresh air and sunlight, and it is the children who suffer most. Witness the enormous child-mortality of the slums. Even if slum-bred children grow up, it is to form but a stunted, pale-faced, wizened race. If flowers cannot grow in the shadow of the slums, we can hardly expect the young human to thrive there. Children should be reared in the country, and allowed to run wild in the fields and the woods. Adults—especially elderly adults—are much more tolerant of slum life; to the children it is only less than death.

SUNLIGHT.

In considering the necessity for fresh air, we have to take into account the beneficial effects of sunlight, whether

* This result would be impossible were acquired characters transmissible, or were the reproductive cells not highly resistant to environmental influences.

direct or diffused. The sun has not without reason been regarded as the upholder, if not the very source, of life upon our globe, and its transcendent importance as such has been tacitly acknowledged from time immemorial. The old Persians worshipped the sun, and there are peoples who do so to this day. When Alexander visited Diogenes in his tub, all that the conqueror of the world could do for the old philosopher was not to stand between him and its beams. Nor was the therapeutic value of sunlight unknown among the ancients. The Romans employed sun-baths for the cure of disease, and the present revival of their use in treatment is but a reversion to an old-time practice.

There can be no doubt that the direct solar rays exercise a definite influence upon the body. This is demonstrated in common experience by the bronzing of the skin which they produce, and in medicine by their beneficial effect on so fell a disease as lupus vulgaris. The sun also benefits by acting as a purifying agent. Thus any organic impurities which the atmosphere may contain are by its means rapidly burnt off and rendered innocuous. Similarly, water which has been exposed for some time to the sun keeps sweet for a longer time than water not so exposed, owing to the restraining influence of the sun's rays on the growth of microbes; and, again, as is well known, the sun bleaches linen and communicates to it a fresh, sweet smell.

The moral is obvious. Every one should get as much sunshine as possible, and since in our climate and under modern conditions much time is of necessity spent indoors, special efforts should be made to obtain it there. Thus dwelling-rooms should have a sunny aspect. Those into which sunlight plays freely are much more healthy than those which it never enters. Therefore in building a

house the rooms, especially the bedrooms, should be so disposed as to secure the maximum of sunlight, and the sick-room should be the sunniest room in the house. I always insist that delicate patients who cannot get out shall have all the sunlight possible in their own homes, due heed, of course, being taken of the exhaustive effects of a too hot sun. It is astonishing what can be done in this way, even in London houses. I recently saw an old bronchitic lady who spent most of the day in a dark room downstairs, and when, on finding that there was upstairs a spacious chamber flooded with sunshine, I got her to change her quarters, her health and spirits underwent marked improvement.

Townsfolk are pale because so little direct sunlight reaches them. Many of the streets are in perpetual shadow, partly owing to their narrowness, partly to the excessive height of the houses. Happily the regulations in regard to the latter point, though still all too lenient, are stricter now than they used to be. Ownership of ground should not carry the right to more than a limited amount of cubic air-space above it, and I would suggest that all the air-space occupied beyond this should be regarded as the property of the municipality, and the moneys derived from it spent in town improvements. The contrast between a broad street of low houses and a narrow street of high houses is sufficiently striking: the one shows a large expanse of sky, and is light and cheerful; the other has a mere strip of sky, and is correspondingly dark and gloomy. Nor must it be forgotten that the direction of a street influences the amount of sunshine it receives. A street running east and west gets more sunshine than one running north and south. In short, the ideal town will have its streets low and broad, and running, as far as is practical, from east to west.

Country and suburban houses should also be low, spreading out laterally rather than upwards, and erring, if err they must, in the direction of lowness rather than of height. A house so constructed is not only more pleasing to the eye than a high one, but it is also more healthy, for while it casts a minimum of shadow, it permits a maximum view of the sky from its immediate surroundings. Moreover, the trees planted near a house should be small, with scanty foliage, such as apple-trees, acacias, laburnums—not large ones, or those with dense, succulent foliage, such as chestnuts and sycamores. Nor should the trees be near enough to overshadow the house.

These principles have been all but entirely disregarded by the modern jerry-builder, who has been left to go his own unholy way in the suburbs of many of our great towns until, instead of the bright, cheerful environs that might have been, we have only drab, sunless wildernesses of bricks and mortar, depressing and soul-deadening in their monotonous ugliness.

OUTDOOR AND INDOOR AIR COMPARED.

I have already alluded to the impurities which the atmosphere may, and in fact to some extent always does, contain. These include pathogenic microbes and the effluvia given off from decomposing organic matter, animal and vegetable. Solid particles of inorganic matter, conveniently included under the general term "dust," are also always present.

Regarding animal effluvia, it has to be remembered that the human organism continually emits poisons both from the lungs and the skin. Individuals differ in regard to the abundance and toxicity of these emanations: some there are who in spite of the most scrupulous precautions

have an unpleasant breath and sweat, and these contaminate the air more than others more fortunately constituted. The character of these effluvia varies with the slightest disturbance in health. In vigorous health they are least poisonous and offensive; but a mere passing indisposition may cause breath and skin, otherwise comparatively inodorous, to become fœtid, and I have little doubt that, were our sense of smell sufficiently acute, we might actually diagnose many disorders from the character of these emanations alone. In serious diseases —*e.g*, in confluent small-pox and diphtheria with sloughing membrane—the body exhalations are highly noxious.

Now, the open air differs from the air of confined places in that it circulates much more freely and is more often flooded with sunlight, with the result that it is being constantly cleansed of its organic contents. Thus the atmosphere of an open space, such as Hyde Park, situated in the midst of a large city, may be surprisingly pure. The air of confined spaces, on the other hand, being comparatively stagnant and receiving little, if any, sunshine, tends to get foul from an accumulation of impurities. Consequently the percentage of pathogenic organisms is higher in dwellings than in the open air, and hence infectious disorders are more likely to be caught indoors than out. The air of dwellings is also more dusty than outdoor air (especially when there is the usual superabundance of curtains, carpets, and other collectors of dust), and a dust-laden atmosphere is injurious to the lungs.

MORBID INFLUENCE OF INDOOR AIR.

We will now consider some of the diseases to which indoor life predisposes.

The connexion between indoor confinement and

anæmia is well known. It is not merely that indoor life causes pallor from absence of sun-burning: the deficiency of sunshine and the vitiated atmosphere lead to actual change in the quality of the blood. Indoor life also predisposes to functional nervous disease of all kinds.

Microbic diseases—and we now know what a large class these constitute—are much more frequently incurred by those leading confined lives than by those who live much in the open, both on account of the excess of germs in human abodes and the lowered resistance to their action which confinement induces. The gathering of a large number of people under one roof is always risky to health, not only because the atmosphere is vitiated by the normal organic exhalations, but because some of those present are sure to be suffering from infectious disorders. Hence we find colds in the head, influenza, and the like complaints often spread like wild-fire in large assemblies.

I may remark in passing that there can be no doubt that the congregating of human beings in towns has rendered them far more liable to infectious diseases than formerly. So long as men wandered about, nude or almost nude, in small groups, and spent most of their time in the open, diseases of this class were comparatively rare; but when they learned to swathe themselves in clothes and to dwell together in large communities, it became inevitable that infections should be disseminated on a scale hitherto unknown.

Among the microbic diseases to which confinement indoors predisposes is rheumatic fever. This disease, comparatively rare in those who spend much of their time out of doors, is met with most frequently among those who, leading indoor lives, are periodically subjected to cold, as, for example, maid-

servants, who, scantily clad in thin cotton gowns, may often be seen washing the door-steps in the coldest, bleakest weather.

But pre-eminent among the diseases fostered by an indoor life are those of the lungs, which cause more deaths all over the world than diseases of any other organs. This is due to the fact that the lungs are peculiarly exposed to morbid influences, for when a vitiated atmosphere is breathed it comes into direct contact with their delicate and highly vulnerable structure. Hence impure air is a potent source of pulmonary disease—above all, of tuberculosis. Numerous statistics attest this fact. Witness the enormous mortality from phthisis that once obtained among some of our guard regiments, and the rapid fall in that mortality directly more spacious barracks were provided. Compare, again, the prevalence of tuberculosis among ranch-fed, with that among stall-fed, cattle. Note, also, how common phthisis was among the monkeys at the Zoological Gardens in Regent's Park, where their average life-duration was, until the recent improvements, only two years. The enormous mortality from phthisis among these animals was obviously due to their being huddled together in an ill-ventilated house, where warmth was obtained at the expense of fresh air. It is a significant fact that the monkeys which have lived longest in this country were always kept in the open, and there can be little doubt that the best way to prolong their lives in such a climate as ours is to harden them to the cold and give them plenty of fresh air, rather than to coddle them up in artificially heated and ill-ventilated buildings.

Exactly the same mistake was made with the anthropoid apes. The chamber in which these interesting creatures were confined was close and stuffy, and a

constant stream of visitors helped further to poison the scanty air-supply. I once visited the place on a hot summer afternoon, and on inquiry I learnt from the attendant that the two inmates, a young chimpanzee and an orang-outang, were not to have an outing that day; also it was evident that they very rarely had one. Could we expect to rear the human infant under these conditions? And if not the human, how the ape?

It is difficult to speak too severely of such cruel carelessness, such total lack of common sense. No animals are so interesting to the biologist as the anthropoid apes. From some such creatures we have certainly ascended, and having snatched them from their native environment, every effort should be made, alike from motives of science and of sentiment, to protect them from disease and lighten the burden of their captivity. They should no longer be kept as objects of the mere idle curiosity of the vulgar; if kept at all, it should be for purposes of expert and sympathetic study. Happily the state of things at the Regent's Park Gardens has recently been much improved, a new ape-house having been built which is in many respects admirable, although the arrangements for ventilation are still by no means perfect. And here let me utter a word of protest against the indiscriminate vivisection of the anthropoid apes. Now that we have inoculated them with syphilis, infected them with yellow fever, and determined the site of their kinesthetic centres, let us be satisfied. I earnestly hope, too, that steps may be taken to protect them in their native haunts; otherwise the most interesting of all dumb animals will very soon have disappeared from the face of the earth.

THE OPEN-AIR TREATMENT OF DISEASE.

It is manifest from the foregoing—(1) that in order to keep well man should secure in his daily life the maximum of pure air and of sunshine; and (2) that in disease he should still make these the great desiderata. The advantage of fresh air in the treatment of pulmonary tuberculosis is now universally admitted; it is found that living night and day in what is practically the open air holds out the best prospect of a cure. But why, I would ask, limit this so-called "open-air treatment" to pulmonary phthisis? Is it not equally indicated in many other diseases?

Especially should we anticipate good from it in the specific fevers. Its applicability to typhus and diphtheria is sufficiently obvious: typhus is essentially a disease of overcrowding, and it is well known that the poisonous emanations from a typhus patient are rapidly rendered innocuous by free admixture with fresh air, while it has been shown that the mortality from diphtheria is greatly diminished by efficient ventilation. A free and abundant supply of fresh air is also imperative in other acute diseases, such as pneumonia and rheumatic fever. The advantages of the open-air treatment in syphilis have been emphasized by E. H. Douty,* and the value of an open-air life for the neurotic and those predisposed to rheumatic fever is unmistakable.

So, too, in the convalescent stage of disease. When I send my convalescents away I generally say to them: "Live out of doors in all weathers. If it rains, put on a mackintosh; if it is cold, wear an extra wrap; but in any case get out all you can." Naturally we choose for convalescents a place where cold and rain will be least

* *British Medical Journal*, February 28, 1903.

likely to tempt them to stay indoors, for the good derived from a visit to a health resort is chiefly due to the fact that it tends to promote an outdoor life. When people go to the country or the seaside, they break the chain of home habits and usually adopt this open-air mode of life, and we may find them sitting, as a matter of course, at open windows at a time of the year when they would never dream of doing so in their own homes.

The open-air treatment, carried out in its entirety, implies that the night as well as the day shall practically be spent by the patient in the open, but in our own country this is found to be a counsel of perfection, and he is often obliged at least to sleep indoors, if not to spend the day there also. Under these circumstances we seek to make the conditions in the sick-chamber as much like those in the open as possible, except perhaps in the matter of temperature. Carried out in the completest manner, this involves the following regulations: (1) That the cubic space for each patient shall be ample; (2) that there shall be a maximum number of window-openings unfitted with windows, and so arranged as to admit a maximum amount of sunshine (light may further with advantage be admitted through the roof; rain, snow, etc., can be excluded by means of Venetian shutters); (3) that the walls and floors of the room shall be smooth and washable; (4) that there shall be a minimum of bed-hangings, curtains, carpets, etc.; (5) that there shall be some means of keeping the room sufficiently warm.

Regarding this last point it should be mentioned that it is quite possible to keep a room warm by means of suitable heating apparatus, even though there is a constant ingress of fresh air. It is seldom needful for the temperature of the room to be much higher than 60° F., and often it may be allowed to fall considerably lower; for a

patient in bed can be kept warm even in the coldest weather by the use of hot-water bottles, sufficient bed-coverings, and suitable nightgown and head-gear. The face is the only part necessarily exposed, and even this can be partly covered. The one thing to guard against most carefully is a draught, and this can be done by the proper disposing of the bed and by the use of screens.

So far as phthisis is concerned, there is no urgent need to warm the sick-room artificially. Writing on the sanatorium treatment of phthisis, Dr. R. W. Philips observes: "I allow the freest access of fresh air to the patient day and night, at all seasons, provided he is sufficiently clad. I am not careful as to the temperature of the surrounding air, whether in or out of doors. Indeed, there seems a disadvantage in endeavouring to combine free exposure of the patient out of doors with his occupancy of rooms whose temperature is maintained constant, or, still worse, which may become overheated. It is more logical, and experimentally more successful, to subject the patient indoors to approximately the same conditions as out of doors. Assuredly let him be comfortably warm by means of clothing, and, if necessary, by hot bottles; but let us be sparing of artificial heating of the atmosphere."*

METHODS OF SECURING FRESH AIR INDOORS.

Apart from the open-air treatment as thus described, we should aim at keeping the atmosphere of the sick-chamber as pure as the external air. As a rule bedrooms are fed to a large extent with air from the rest of the house, for it must not be forgotten that during the night there is a constant stream into them of air, generally impure, from the landings and lower rooms, and it is

* R. W. Philips, M.A., M.D., "The Sanatorium Treatment of Phthisis," *British Medical Journal*, December 14, 1901.

therefore a good plan to open, for a short time before going to bed, the hall door and the windows of the lower rooms, especially those which have been inhabited during the evening. Landing windows should be open day and night.

As to the bedroom windows, possibly the time may come when all of them will be made so as not to shut completely. Certainly I shall not be accused of fanaticism in saying that they should *never be completely shut.* During the day they should be wide open, so that the air may circulate freely about the room. It is not enough to effect a momentary change of the main bulk of the air, because the polluted air tends to stagnate in corners and recesses, to stick to surfaces, especially rough surfaces, and to be absorbed by porous substances. Hence walls and floors should be smooth and washable, and there should be a minimum of carpets, curtains, bed-hangings, and the like. The fresh air should be allowed to play freely upon the bed-clothes and the bed, and it is a good plan, where facility offers, to expose the former, especially the linen, to the sunshine, the purifying effect of which is made evident by the sweet "smell of the country" it communicates to them. Clothes worn during the day should not, of course, be kept in the sleeping-room at night, and the non-washable articles may with advantage be occasionally hung out in the open air, in order that they may be freely ventilated and purged of any organic matters that they may have absorbed.

CHAPTER XXII

CLOTHING

INFLUENCE OF TEMPERATURE ON METABOLIC ACTIVITY.

In health the organism is kept, by means of an adjusting mechanism, at a temperature that only varies within a fraction of a degree, and this nearly constant level can be maintained under exposure to wide extremes of temperature. Beyond these extremes, however, the body behaves, in respect of chemical activity and temperature, after the fashion of lifeless matter, both the one and the other rising and falling with the temperature of the surrounding medium, as happens also in the case of the cold-blooded animals. When, for instance, the external temperature rises above the upward limit of adjustability, metabolic activity is augmented and the body-temperature rises beyond the normal; and, on the other hand, as the external temperature falls below the limit of adjustability, metabolic activity slackens and the body-temperature falls below the normal. So long, however, as the organism is exposed only to temperatures within the range of adjustability, it does not, so far as chemical activity is concerned, conform to the law which applies to lifeless matter and to cold-blooded animals, but acts in an exactly contrary manner—that is to say, with a rise of external temperature, metabolism slackens so as to

reduce heat-production; and contrariwise, with a fall of external temperature, metabolism becomes more active and the production of heat is augmented.

Augmentation of Metabolism.—We have thus a means of regulating metabolic activity, of either augmenting or diminishing it. We can augment it by exposure—(1) to cold, and (2) to excessive heat, general or partial.

The increase of metabolism caused by exposure to cold is familiar; it is met by a correspondingly increased demand for food, and hence more food is consumed in cold weather than in warm. These facts we make use of if we desire to brace up the system. Instead, *e.g.*, of allowing a patient to stay indoors by the fireside on a bright wintry morning, we encourage him to go out; and for a similar reason we may send him to a high altitude.

When, however, all that we desire is to augment metabolism *locally*—*e.g.*, in a stiffened knee-joint—we place the affected limb in a chamber of super-heated air. The temperature of the part thus locally treated rises considerably, and it seems probable that the beneficial effect that follows is in large measure due to the augmented metabolism thus resulting. This treatment has also a general constitutional effect, probably by sending up the body-temperature and thus stimulating metabolism.*

Diminution of Metabolism.—So much for the methods of exciting metabolism by lowering the external

* In regard to the augmented metabolism of fever, Dr. Francis Hare believes that it is often of use in burning off an excess of carbonaceous material in the blood. Thus he argues that the fever which attends the attack of acute gout is curative, and in like manner he attributes the beneficial effect of the seton to the fever which it sets up. See his book "The Food Factor in Disease."

temperature. We may, on the other hand, desire to restrain metabolism, and to this end we may take advantage of the fact that metabolism becomes less and less active as the external temperature approaches the upper limit of adjustability. Thus we seek to reduce heat-loss to a minimum, and this we do by putting the patient to bed, covering the body and even part of the face suitably, and keeping the temperature of the room at, say, 70° F. It is not mere hearsay, but an actual fact, that a person in a state of profound hypnosis will, even though buried and therefore without either food or air, remain alive for several weeks, the vital activities being for the time practically in abeyance. Now, it is evident that this would be quite impossible if the body under these conditions—quiescence and warmth—lost heat in any but the smallest degree, for, were there an appreciable loss of heat, then, in order to keep the body-temperature at a level consistent with life, there must be active metabolism, and this, in the absence of food and air, is an impossibility. Accordingly, the late Dr. Carpenter premised that the above experiment could only be successfully carried out if the medium in which the body was buried had about the normal body-temperature. The truth I wish to drive home here, however, is that by preventing heat-loss we tend to restrain metabolism (provided, of course, the temperature is not super-normal), and that this being restrained, we can reduce the quantity of food needful for the preservation of life. But rest as well as warmth prevents heat-loss, and thus restrains metabolism and diminishes the need for food. Hence the most effectual way to secure these ends is to combine both methods, by enforcing absolute rest in bed and reducing to a minimum the loss of heat from the body—in other words, to imitate, as far as possible, the conditions of the buried fakir. With the

object of preventing heat-loss, the bed-clothing should be ample and the temperature of the room kept at 70° F., or even more, so as to check the loss of heat from the face and hands, but above all from the respiratory passages, from which cold inspired air is capable of abstracting a considerable quantity of heat.

If this plan is adopted, it is astonishing how long life can be sustained on small quantities of food, or even on no food at all; and there are occasions when it is wise to reduce to a minimum the ingestion of food, or, it may be, to stop it altogether. Thus in perforating gastric ulcer we may be compelled to feed *per rectum* alone, and this implies a great reduction in the normal quantity of food absorbed. Again, in cases of kidney disease and failing heart, it is often desirable to reduce the intake of food to a minimum, and thus economize to the utmost the work of these organs.

THE MOST "NATURAL" TEMPERATURE OF THE EXTERNAL MEDIUM.

Man is of all animals the most widely distributed over the face of the globe, and this is largely due to the fact that he alone has learnt to accommodate himself to extremes of temperature by the help of clothing. In the Arctic regions he clothes himself in furs; in the tropics he can go nude.

We may regard it as certain that man's gorilla-like ancestor, in spite of his hairy coat, was, like his surviving congeners (gorilla, chimpanzee, etc.), confined to tropical regions; and but for this later-acquired ability to clothe himself, the lack of a natural covering to protect him from cold would in the main have restricted man's range to these permanently. I say "in the main," for naked

savages are to be found in very cold regions, as in the well-known case of the Fuegians referred to by Darwin. The subsequent gradual loss of the hairy coat, probably through sexual selection, before sufficient intelligence had evolved to suggest the substitution of clothing, must have tended to delay the ape-man's migration into colder regions; from which we may infer that the ape-like man and primeval man—the two last stages in his ascent—must alike have been limited in their distribution to the tropics, or, at any rate, to these and the subtropical regions of the world. Hence *our ancestry, stretching back into the remote past through the stages of primeval man and ape-like man to the man-like ape, inhabited warm regions.* But when, with the dawn of a higher intelligence, our primitive ancestor had learned to protect his body against cold, and also to add to his supplies of food by hunting,* he was free to migrate to colder climes, even to the coldest regions of the earth; and researches among the Esquimaux of the Arctic zone show that in quite an early period of his history he found his way thither.

Man has thus become adapted to many different climates, and is capable of withstanding alike an Arctic and a tropical temperature.

My object in the foregoing remarks is to emphasize what I believe to be an important and far-reaching therapeutic truth—namely, that his ancestry having from

* For I believe that it was his difficulty in procuring an adequate supply of food throughout the year, rather than his lack of clothing, which prevented man from spreading beyond his ancient tropical home. It was not until he had become a skilled hunter, and was thus able to obtain abundant supplies of animal food at all seasons, that he could subsist throughout the year in any but tropical and subtropical regions.

remote times inhabited a warm region, and having only recently acquired the power of living in cold regions, man is still essentially adapted to a warm environment. Modern man, in short, even though he can live in cold districts, needs to be kept warm; and he meets this need by the wearing of clothes, which raise the temperature of the atmosphere immediately enveloping his body to some 80° or 90° F.—almost, that is, to tropical heat. In other words, he secures much the same external temperature as that natural to his remote ancestors.*

Man's primitive proclivities show most pronouncedly in early life, in old age, and in disease, and in all three periods we find the necessity for external warmth emphasized. Young children, especially infants, do well in warm countries; old people crave sunshine and warmth; and when a person gets ill, does he not generally creep to the fireside?

The moral is obvious. We must be especially careful to keep our children, our aged, and our sick warm. When a person is downright ill there is no place like bed, not only because it gives rest, but because it provides a warm and equable medium. Inasmuch as a very limited cutaneous surface is exposed in bed, it is not always urgently necessary to keep the temperature of the sick-room high; but it is often advisable to maintain it at from 60° to 70° F., especially for the very young and the aged, and in diseases of the lungs, in which cold air may irritate the bronchi. This temperature should be main-

* The very next day after writing the above I was interested to read the following passage in Hutchison's "Food and Dietetics," edit. 1, p. 49: "Thanks to the fact that we wear clothes, we live in an atmosphere of about 90° F.—*i.e.*, in what is practically a tropical climate."

tained day and night, particular care being taken not to let it fall in the small hours of the morning, for it is then that the body-temperature reaches its minimum ; and in the feeble and aged, who develop heat slowly, life often flickers out at this time.

ON CATCHING COLD.

This seems a fit place to refer to the subject of "catching cold." It is well known that certain diseases, such as rheumatic fever and pneumonia, may result from a chill, from sleeping in a damp bed, sitting in a draught, or getting wet through, especially when with these conditions are combined exhaustion and debility. Now, these diseases are certainly microbic in origin. How, then, does cold excite them? Evidently by diminishing the resistance to certain pathogenic microbes already present in the body, and thus allowing them to multiply. In what way cold diminishes the resistance is not known. The mere lowering of the body-temperature alone would appear to diminish it as regards certain microbes. Thus, chickens can be rendered susceptible to anthrax by being kept for some time with their feet in cold water. Another possible factor, in the case of man at least, may be the influence of cold in checking the action of the skin and thus increasing the toxicity of the blood.* In this way, too, we can explain the effect of a chill in causing a non-microbic disease, such as nephritis, which may certainly be excited by toxæmic states.

This explanation seems all the more probable in view of the fact that a chill is especially apt to excite disease when the body is exhausted by fatigue—say, after a long march—and the blood sur[illegible] waste products needing elimination, and t[illegible] t the best way

* See [illegible]

to obviate the effect of a chill is to secure free action of the skin by a warm bath, hot-water bottles, and kindred means, coupled with the administration of a purge.

It must not, however, be supposed that cold is *per se* necessarily harmful. The diseases just mentioned are, on the whole, less prevalent in the depths of winter, especially during dry, frosty weather, than at other times; and there is some truth in the old adage that "a green (= mild) Christmas makes a fat churchyard." Furthermore, patients in high fever can often not only be subjected to cold (*e.g.*, cold baths, wet pack) without hurt, but even with actual benefit.

We sometimes find it difficult to persuade patients to sleep with the bedroom windows well open; they are afraid of catching cold. It must be pointed out to them that provided they are kept warm in bed and out of a draught, there are few affections in which harm is likely to come of breathing cold air; while in those cases where cold air may be injurious it is quite possible to keep the room warm even with the windows wide open.

BED-CLOTHING FOR THE SICK.

When a patient is in high fever and it is desirable to reduce it, the bed-coverings should be scanty. Heavy bed-clothes are then doubly injurious; they help to sustain the high temperature by preventing the dissipation of heat, and by their dead weight they impede the respiratory movements and thus tend to exhaust the patient.

I have frequently seen heavy coverings piled on a patient in high fever (suffering, *e.g.*, from enteric), and too weak, or too torpid, to complain, and upon the removal of all but the sheet the temperature has sensibly

fallen. Here, as elsewhere, we must be guided by common sense. Our object must always be to keep the patient warm; but in high fever he is already too warm, and it is undesirable to send up the temperature still further by superabundant bed-clothing. We must regulate the covering according to the circumstances.

When there is shivering we are guided by the patient's instinct, which leads him to seek external warmth. If, again, we desire to promote sweating—*e.g.*, in the cure of a "cold"—we may adopt the old-fashioned plan of wrapping the patient in blankets. Similarly, when the fever rises at night, as in enteric, the bed-clothes should be scantier than in the morning when the temperature falls. In no case should they be heavy. It is possible by means of an eider-down quilt to secure the necessary warmth with very slight weight. The best garment for a patient who has to remain long in bed is a "long flannel nightgown, split all the way down the front and back and tied with tapes." (F. J. Smith.)

OBJECT OF CLOTHING.

In clothing the body the great object to aim at, from the medical standpoint, is to keep it warm while allowing the fullest possible freedom of movement to the trunk and limbs. In so far as clothing impedes natural movement it is injurious.

These points must be kept well in view in the clothing of infants, with the addition that the means employed must be the simplest possible. The fewer the garments worn the better. Cumbersome finery is barbarous; equally barbarous is the binder if it interferes in the least with the child's breathing.

The plan of keeping a child's legs and arms bare is wrong, especially in cold weather. It is quite common,

especially among the poor, to see children running about with bare arms and legs in the coldest weather. If such children have the rheumatic taint, they run great risk of getting joint trouble, apart altogether from other mischief, such as bronchitis, enteritis, and pneumonia.

But while children stand in great need of warmth, we must be careful not to bring them up like hot-house plants. We must seek to harden them against the ill-effects of cold, and the best means to this end is to keep them as much as possible in the open.

In a work like the present it is quite unnecessary to enter in detail into the hygienic aspect of the different articles of clothing. This is already done in special works, and I shall content myself by referring to only a few items of dress, with the object of showing how custom may blind us to acts of great folly.

Modern Head-gear.—The miller is said to wear a white hat "to keep his head warm," and doubtless this expresses the popular view of the primary purpose of a hat. But why, it may be asked, should it be considered necessary to keep the crown of the head warm, while exposing the forehead, face, and neck? Why seek to keep warm, by an artificial and often cumbrous covering, that part of the head which is protected naturally by an abundant thatch of hair? The fact is, there is no need whatever to keep the head artificially warm, and the only useful purpose head-gear can serve is to be a shield from the rays of a blazing sun. Experience has conclusively shown, in the case of the Bluecoat boys, that even when the hair is cut short and its efficiency as a protection so far lessened, it is yet an all-sufficient covering for the head; and there can be little doubt that these Bluecoat boys could go through life very comfortably without ever wearing hats.

None can gainsay this. Manifestly hats are not needful, except, perhaps, as an occasional protection from the sun, and we might save future generations of man much trouble and expense were we to bring up our children to dispense with head-gear altogether. But if only inconvenience and expense could be urged against the use of hats, I should probably not allude to the subject here. There is no objection to a harmless amusement, even though it may be ridiculous. The wearing of hats is, however, far from being a harmless amusement: it is responsible for millions of bald heads among men now living. Baldness is, in fact, the price which a large proportion of men pay for indulging in the pastime of hat-wearing. Now observe the irony of things. A man wears a hat under the mistaken belief that it is needful to keep his head warm, and by so doing he slowly and steadily denudes his scalp of the very efficient means which Nature has provided for that purpose. Then indeed a hat does become necessary: the unfortunate victim of unreasoning custom, with his naked and atrophied scalp, is in constant fear of catching cold and has scrupulously to avoid draughts; but even with his hat he is not so well protected as Nature had originally protected him.

Yet, plain and simple and common sense as all this seems—the mere ABC of reasoning—I do not find that men have awakened to its truth. I have often found it most difficult to persuade them that hat-wearing is a cause of baldness at all. In vain have I argued that the only part of the body to go bald (except from disease) is precisely that part which is covered by the hat; that the pressure of the scalp between the unresisting cranium and the hard-rimmed hat strangulates the blood-vessels—arteries and veins—of the scalp, and by diminishing the

blood-supply to the vertex, leads to its atrophy in that region, for it must not be forgotten that baldness is not a mere absence of hair—the scalp is actually atrophied; in vain have I urged that those who go bald are such as have thin skin and fine hair, and whose scalp-vessels are therefore so much the more exposed to the influence of pressure, while those, on the contrary, who have thick scalps and coarse hair retain their hair because the blood-vessels are protected from pressure.

What I would advocate is, that all boys' schools should adopt the custom of Christ's Hospital and discard head-gear. If in after-life a hat is worn, let it be understood that it is worn, not because there is any need of it, but in obedience to fashion; and let the hat be of the kind least likely to cause baldness. The strangulation referred to is caused by a circle of compression, and the harder the rim and the heavier the hat, the greater will this compression be. Hence the hat should be light and have a soft, yielding rim. If hard and heavy, the weight of the hat should be borne not by the rim solely, but distributed more equally over the entire covered part of the head. The popularity of the hard-rimmed hat is probably due to the fact that it tends to keep the hair tidy. This it certainly does; eventually indeed most effectually doing away with all difficulty in the matter.

It is strange that men have not yet waked up to the absurdity of the modern high hat. Only one argument can be advanced in its favour—*i.e.*, that it is some protection against certain sorts of injuries, such as from a falling tile or a pitch from a horse. Nothing else can be urged in its behalf. It does not shelter from rain, for if rain comes on, up goes the umbrella to protect the hat; nor does it shield the head from the wind, for in a strong breeze one has to exercise all one's ingenuity to keep it

on, especially if at the same time there is an omnibus in motion to be mounted, and a bag to be carried; and if perchance it should be blown off, where is the man who can preserve his native dignity while chasing it along the street? Nor does it protect against heat: no one would think of equipping a regiment bound for the tropics in high hats. On the other hand, it has many disadvantages: it is supremely ugly, and offends not only as being so but by dominating the entire modern fashion, for the whole man has to be dressed in accordance with it; it is expensive; it is a great cause of headache; and it is —worst indictment of all—the chief cause of (crown) baldness. An impartial judge cannot fail to pronounce that the wearing of a ring through the nose is very much less ridiculous than the wearing of high hats—a fashion only rivalled in its folly by the practice of tight-lacing. It is the duty of medical men to make their influence felt in this matter.

The Corset.—But the most injurious article of modern dress—far more injurious than the hard-rimmed hat—is undoubtedly the corset; for without question it is responsible for a great deal of disease. Ordinary stays for adults, even when made of the most pliable material, laced with elastic cord and worn loose, interfere with proper breathing, for they do not admit of complete inspirations. If they did, the hand could be placed under the corset at the end of the deepest inspirations without being compressed. As a matter of fact the thorax of all corset-wearers is distorted, the lower part being compressed and the upper unduly expanded and mobile, so that no woman who has habitually worn stays can be employed as an undraped model. The greater mobility of the upper part of the chest in the woman is not an innate sexual peculiarity, but an acquisition.

For a full account of the evils which result from the wearing of the corset I must refer the reader to my work on Respiratory Exercises (p. 132 *et seq.*).

Doubtless for very stout women some sort of stays may be advisable, but for all young girls and for a large number of women they are quite unnecessary. Inasmuch, however, as the modern dress of women is devised for a corset-sheathed figure, many women who would be glad to go without stays continue to wear them rather than look peculiar. Thus it is the dressmaker who is at the root of the evil, and not content with insisting upon her customers wearing stays, she often persuades them to "tighten in" dangerously. It is our bounden duty to do what we can to lessen the evil practice: even if we achieve a little, it is something accomplished, and we can scarcely hope to do more at present, since behind the dressmaker shelter our real antagonists—the tyrants Custom and Fashion.

Stiff Linen.—The stiff-fronted shirt and the stiff collar worn by men are scarcely less irrational than the articles of dress just referred to. All clothing should be pliant, and should readily adapt itself to the form and the movements of the body; whereas the modern shirt-front and collar might be made of so much tinfoil so far as concerns this quality of pliancy, and they are neither sensible nor elegant. Soft, pliant shirts and collars are not only more comfortable, but they allow of greater freedom of movement; and we should insist upon their use in all cases where disease makes this especially advisable (*e.g.*, in serious heart or lung disease), to avoid any unnecessary hindrance to the respiratory movements. It is painful to see a stout emphysematous man, as one frequently may, with a rigid, sharp-edged collar digging into his short plethoric neck, and a large plate of stiff

linen riding uncomfortably on the front of his chest. Why men should persist in covering the front of the body from the neck to the waist in an armour-plate of laboriously and expensively got-up linen, which, save for a small patch above, they carefully conceal from view, is a problem I leave to the speculative psychologist. Personally, I can only regard it as a curious whim, entailing wholly unjustifiable labour and expense. Assuming the extra cost entailed by the stiff front to be one penny per clean shirt (a very moderate estimate), I compute that at least fifty thousand pounds (probably much more) are annually spent in London alone over this weird whim of man, and I cannot but think that this money might be spent in a worthier cause.

CHAPTER XXIII

MUSCULAR EXERCISE

MUSCLE-METABOLISM.

The muscular system constitutes about half the body-weight, and contains, even when in a state of comparative rest, a good quarter of the total blood-mass. During active exercise it holds much more than this—probably one-half, at least, of the entire amount. By reason of its mere bulk, therefore, and its copious blood-supply, it is obvious that this great system must play a prominent part in the metabolism of the organism, and this conclusion becomes all the more evident when we reflect that muscle is the most vitally active tissue in the body, not even excepting gland-tissue, for the muscles are *par excellence* the source of bodily energy.

The energy liberated by the muscles is manifested partly as "work," partly as heat. All the work of the body is done by the muscles, whether it is internal work—such as the circulation of blood and lymph and the movements of respiration and peristalsis—or external work, such as walking, running, jumping, or carrying a weight.

While thus discharging energy in the form of work the muscles also evolve heat, the temperature of the muscle-substance rising during contraction; for the muscle-machine, like the steam-engine, is only able to convert a

comparatively small part of its energy into work, fully four-fifths being manifested as heat, much of which is pure wastage. Not that all the heat thus liberated is necessarily lost, for in cold weather that which is developed by exercise helps to keep up the body-temperature. Nevertheless, active exercise in all but very cold climates leads to the evolution of much more heat than is needed by the organism, and the excess may prove a serious encumbrance, for though it is in part got rid of by special provisions during violent exercise, these are not always adequate to keep the body-temperature down to the normal, and as a consequence there may be a rise of one or two degrees.

It will thus be seen that the muscle-engine is by no means an ideally economical machine, though probably more economical than the steam-engine.

It must not be supposed that it is only during active contraction that muscle-katabolism is brisk; even when relaxed the muscles are busily katabolizing and liberating energy in the form of heat, and it is chiefly by means of this heat that the body-temperature is kept up to the normal level. This heat-production would appear to be under the control of the nervous system, which some assert can not only induce in muscles that kind of katabolism which issues in contraction, but can so regulate the katabolism of relaxed muscle-tissue as to lead to the production of a greater or less quantity of heat according to need. However this may be, it will be seen that the muscles constitute the chief furnace of the body.

We must conclude therefore that the degree to which katabolism takes place in relaxed muscles depends in part upon the amount of heat required. It also depends —and this is an important point—upon the quantity of food-stuffs in the blood. When the blood is richly

laden with food-stuffs, whether carbonaceous or proteid, to the muscles falls the task of burning off any excess. A person not increasing in weight, and passing neither albumin nor sugar, katabolizes the whole of the absorbed food day by day, the proteids almost immediately (as shown by the rapid rise in the excretion of urea after their ingestion), the carbonaceous food less rapidly. Even when a bare sufficiency of food is being absorbed, it is still in the muscles that it is chiefly katabolized, while it is essentially on them that the task falls of katabolizing any food that may be absorbed in excess of the actual requirements of the organism. And it is a fact of great physiological interest that the muscles are able, even when in a state of so-called rest (relaxation), to burn off this excess of fuel, though probably not so efficiently as during active contraction.

We must assume that the molecules of the muscle-substance are abundantly supplied with side-chains capable of linking on the molecules of food-stuffs, and that the latter are speedily caught up by the muscle-protoplasm and katabolized.

To sum up, the katabolism of the muscle is increased—(1) by muscular exercise; (2) by cold, leading as it does to a demand for extra heat-production; and finally (3) by excessive eating, in consequence of which the blood becomes surcharged with food-stuffs.

Though, as we have just seen, the katabolism of the muscles may be active even during "rest" (when the entire muscular system, *i.e.*, is in a state of comparative relaxation), we must not conclude that this relaxation-katabolism is necessarily the same as the katabolism of active exercise, nor that the waste-products poured into the blood are the same in both cases. Suppose a person of sedentary habit to be consuming a large quantity of food; on the little-

used muscles will fall the main task of katabolizing the excess, but the katabolism will probably not be altogether the same as if the muscles were being energetically exercised, nor will the waste-products yielded to the blood be identical. Whether or not we correctly indicate the main difference in the two cases by saying that oxidation is less complete in the former case than in the latter, we need not stop to discuss; but we shall probably not be far wrong in concluding that the nature of the katabolism in the muscles of our sedentary man is less favourable to health (predisposing to toxæmia, gouty or other), than it would be if he vigorously exercised them. It is not to be inferred that this inefficient muscle-katabolism is the only factor in the toxæmia of the sedentary over-fed. Sedentary life tends to a general sluggishness of metabolism, to inactive circulation, and to defective elimination; but we shall do well to dwell on the fact that muscular exercise benefits not merely by rousing metabolism generally—by stimulating the circulation of the blood and lymph and causing the skin and other emunctories to act—but also by specifically influencing the metabolism of what are, metabolically considered, by far the most important tissues of the body.

EFFECT OF MUSCULAR EXERCISE ON THE RESPIRATORY MOVEMENTS.

Muscular exercise raises the percentage of CO_2 in the blood, and in this way influences the respiratory centres, and so the respiratory movements. The latter are increased in frequency and amplitude, while inspirations tend to be more complete than expirations. Especially is this the case in pronounced breathlessness. It may then be observed that while inspirations are deep, expirations are comparatively incomplete, so that the mean

size of the thorax is increased, the enlargement being in proportion to the degree of breathlessness. Hence the thorax is larger during the act of walking than in repose, and when a person is running than when he walks. One of the objects of this augmented pulmonary capacity is doubtless to open up the pulmonary circuit and thus facilitate the work of the right heart, which during vigorous muscular exercise has, as we shall presently see, to drive an extra quantity of blood through the lungs.

Seeing that exercises which cause breathlessness expand the chest, it follows that we have in them a ready means of permanently augmenting thoracic capacity, for inasmuch as the predominant action of the inspiratory muscles causes a permanent shortening of them, the chest becomes fixed in an expanded position.* Hence the best way to bring about a permanent enlargement of the thorax is to prescribe exercises which induce breathlessness, such as running, skipping, dancing, mountaineering, rather than gymnastics, and dumb-bell and kindred exercises, which cause comparatively little breathlessness and increase the girth of the thorax mainly by developing the muscles enveloping it.

Muscular exercise, while augmenting the respiratory movements in the manner indicated, tends also to modify their rhythm. Thus when breathlessness is pronounced inspirations are more complete than expirations, and they occupy a longer time—in the proportion, it may be, of three to one. This curtailment of the expiratory act is doubtless connected with the retarding effect of expiration on the pulmonary circulation.

* See "Respiratory Exercises" by the writer.

EFFECT OF MUSCULAR CONTRACTIONS ON THE CIRCULATION.

When a muscle contracts, its arteries dilate and an extra quantity of blood flows into it; and when a large part of the muscular system is thrown into contraction, as happens in such exercises as walking, running, rowing, and riding, it is obvious that an abundance of blood must be diverted into the muscles from other parts. Whence comes this blood? Very little can come from the brain, and none from the thorax, the supply of blood to which is indeed actually augmented by rhythmic muscular contractions. There is but one possible source of it—*i.e.*, the abdominal and pelvic area, and there can be no doubt that it is from this area, and especially from the splanchnic portion, that it is chiefly derived.*

The effect, then, of muscular exercise—and it is important to remember this—is to deplete the abdomino-pelvic viscera of blood and to fill the muscle-vessels, and, in the case of rhythmic contractions, as will be shown, the vessels of the thoracic viscera also.

Muscular exercise stimulates the heart partly by increasing the flow into the right side, and partly by causing the entrance into the blood of certain products of muscle-katabolism, these acting upon the cardiac nervous system much in the same way as we may suppose drugs to do.

How great this cardiac stimulation is, the most moderate muscular exertion suffices to show. We possess no other agent in any way comparable to muscular exercise as a means of stimulating the heart. It has, however, one

* The correctness of this *a priori* conclusion has been proved in an ingenious way by George Oliver. He has shown that while after a period of rest a considerable quantity of blood can be squeezed out of the abdomen into the systemic vessels, after exercise abdominal compression fails to cause any such transference ("The Blood and Blood-Pressure," pp. 163, 164).

disadvantage: it tends very materially to increase the amount of work put upon the heart by augmenting the quantity of blood flowing into that organ. But observe in this respect rhythmic and tonic contractions stand in sharp contrast, for whereas the former greatly increase the flow into the right heart, the latter do so to a much less extent, if at all. Let us see why there is such a difference in the two cases.

The muscle-veins are, like all veins, highly compressible, owing to the low blood-pressure within them, and they are, moreover, abundantly provided with valves; the arteries, on the other hand, are not only comparatively incompressible but devoid of valves. Hence it happens that every contraction of a muscle, while it has little effect upon the muscle-arteries, squeezes the blood out of the muscle-veins which, during the periods of muscular relaxation, rapidly refill from the dilated arteries. It will thus be seen that when the entire muscular system is thrown into rhythmic contractions, as happens in walking, running, and such exercises, the blood is pumped in large quantities into the venæ cavæ, so abundantly, it may be, that the right heart, unable to pass it on to the lungs quickly enough, becomes over-distended and temporarily paralysed, so that the systemic arteries are deprived of their proper supply of blood, as shown by the blanching of the face and the feeling of faintness which result under these circumstances. In order to expedite the pulmonary flow in such cases the chest is expanded, and thus is explained the fact, already alluded to, that during rhythmic muscular exercises the quantity of blood within the thorax is augmented.

Rhythmic muscular contractions also greatly augment the flow of lymph from the muscles and hurry on the lymph circulation generally. Indeed, when a limb is at

rest no lymph flows from it, but during rhythmic contractions considerable quantities escape. This lymph is derived from the capillaries; from which it follows that rhythmic muscular contractions cause an increased exudation of fluid from the capillaries, owing, presumably, to the increment of pressure within them. It is in this way that George Oliver has explained an interesting fact observed by him—namely, that the relative quantity of the corpuscles is increased in the blood of an exercised limb. This influence of exercise on the circulation of blood and lymph "explains to a large extent the wide-reaching effect of exercise on the nutrition of all the tissues by promoting that most important part of the circulation of fluids—the intermediary circulation" (*op. cit.*, p. 50).

The effect on the circulation of tonic, is very different from that of rhythmic, muscular contractions. While the arterial flood-gates of the muscles are open and blood is thus attracted to the latter, the muscle-veins are kept compressed, and thus it comes about that the amount of blood flowing from the muscles is much less during tonic than during rhythmic contractions. Though doubtless greater during widespread tonic contraction than when the muscles are at complete rest, the total flow of blood from the organism at large into the cavæ is probably not materially greater in the one case than the other. While therefore *in widespread tonic contraction there is a determination of blood to the muscles and a stimulation of the heart and respiratory movements, the quantity of blood flowing into the right heart is kept down, the total effect being a filling of the systemic arteries at the expense of the veins.*

What are the circumstances under which a widespread tonic muscular contraction occurs? The most familiar instance is afforded by standing, which necessitates the contraction of a large portion of the muscular system

in order to maintain equilibrium. Now, if in this position a resisted movement of a limited set of muscles, say of the forearm, is made, the muscles engaged in balancing the body contract still further. Extensive tonic contractions are likewise induced when resisted movements are performed in the sitting, or even in the horizontal, posture. We are thus able to see how these movements tend to unload the veins and fill the arteries. Care must, however, be taken to prevent the patient, during their performance, from fixing the chest and thus blocking the pulmonary circuit.

INFLUENCE OF MUSCULAR EXERCISE ON EXCRETION.

Muscular exercise increases the waste-products in the blood. These are got rid of by the skin, kidneys, and lungs; hence the excretory activity of all three is augmented by muscular exercise. Besides CO_2, organic and volatile products are given off from the respiratory tract in increased abundance. Not only is there an increased elimination by the skin of water, but also of poisonous excreta, chiefly in the volatile form, so that the skin may be said literally to exhale poisons. Witness the overpowering odour in an ill-ventilated barrack-room after, say, the men have just returned from a long march. Should the free elimination of these poisons be checked, grave injury may follow. It is well known that a person exhausted by long and arduous exercise is apt to suffer from exposure to cold, and it seems not unlikely that this may be because a chill checks the proper action of the skin, thus adding to the undue accumulation in the blood of poisons, and that these in some way diminish the power of the organism to cope with pathogenic microbes—*e.g.*, the pneumococcus. It is significant in

this connexion that the best way to obviate the ill-effects of "a chill" is by means of a warm bath (by which the skin is made to act) and an aperient.

As regards the influence of exercise on the kidneys, most of the urinary solids tend to be increased, the output of urea, however, remaining unaffected. The deposit of urates as a result of those exercises which cause stiffness is noteworthy. Thus riding, playing football, tennis, etc., for the first time after a long interval usually cause some stiffness, and a copious deposit of urates. According to Legrange the stiffness and the deposit always go together; he attributes the former partly to the bruising and tearing of the muscular, fibrous, and other textures, but chiefly to the presence in the parts where the stiffness is felt of certain substances which yield urates. He has shown that the cloudiness of the urine does not appear until three or four hours after the exercise causing it, and that it continues for from twelve to twenty-four hours, and he insists that the output of urates in these cases is actually increased. It is remarkable that, when a person is in good trim and able to indulge in violent exercise without producing stiffness, the deposit is less likely to occur.

The foregoing considerations concerning the physiology of the muscular system—its enormous bulk, the large amount of blood it contains, its great metabolic activity, the part it plays in katabolizing food-stuffs brought to it by the blood, its influence on excretion and on the circulation of blood and lymph, not to mention other effects which it is impossible to enter upon here—will serve to impress on us the pre-eminent share this system takes in the total vital activity of the organism, and to prepare us for the conclusion that a due exercise

of the muscles is needful for the attainr
health.

The same conclusion is suggested by
thought. Primitive man and his anthrc
were kept—as, indeed, all the higher ve
man, are still kept—in a state of almost co
activity in their search for food, the avo
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favourable to either.

EXERCISE IN RELATION TO THE NERV

Exercise of the muscles involves not o
themselves, but the nervous system associ
—*i.e.*, the neuro-muscular system. Eve
in the body is supplied with a nerve-fi
definite central connexions, and every vol
contraction of a muscle-fibre takes place
an impulse striking it through its nerve
during muscular exercise millions of i
along the motor nerves, these impulses be
in the central nervous system, and it is th
that we have to keep in view when prescr
we must always consider how they will af
as well as the muscular, system.

In learning to perform exercises requ
such as billiards, cricket, and the pla
instruments, it is the nervous, not the m
that we are educating; consequently su
increasing voluntary control over the m

strengthen the will-power generally. It is quite astonishing what limited muscular control the uncultured classes generally have—a limitation which is often paralleled by a similar limitation of will-power.

It is clear, then, that exercises of skill may be of service in correcting a faulty nervous system. From this point of view the salutary influence of such a game as cricket can scarcely be exaggerated, inculcating as it does habits of patience, judgment, self-control, self-reliance, courage, and good temper; and similarly, by suitable exercises we may do much to break the nervous system of bad habits—*e.g.*, habit spasms, choreiform movements, and even the inco-ordination of locomotor ataxy.

Exercise, especially such as is involved in outdoor pursuits, tends to promote physical courage, as shown by the tenacious courage of prize-fighters, which is largely due to the training they undergo for the ring. For exercise has a decided effect on the emotions. When, *e.g.*, the body is in a vigorous state, muscular exertion is stimulating, causing, as Legrange puts it, "a greater intensity of life," both in the emotional and the physical sphere: witness the animating effect of dancing which, overleaping physiological bounds, may pass into actual frenzy, as in the war-dances of savages, the wild gyrations of dancing dervishes, and the dancing epidemics of the Middle Ages. We may observe the same phenomenon in a horse which, starting at a moderate pace, may get inebriated, as it were, by its own muscular activity and become dangerously excited and out of hand.

The stimulating effect of horse-riding, cycling, and allied exercises is shown by the fact that they may not only remove a feeling of exhaustion, but actually induce in its stead one of exhilaration. A tired, languid man

who, feeling "exhausted," not unnaturally thinks he needs to take in a fresh supply of energy in the shape of food, may find himself much more invigorated by a good gallop than by a meal. In such a case the feeling of exhaustion has not been due to an actual exhaustion of his store of energy (on the contrary, the tissues may be well nourished and the blood rich in food-stuffs), but to the accumulation in the blood of poisons which depress the nervous system, and the effect of the gallop is both to rouse the torpid centres and to aid the elimination of the noxious matters.

But all exercise is not stimulating to the emotions. Exercise which produces exhaustion tends to depress them.

As regards the intellect, gentle exercise has been thought to facilitate thought-processes; but though this may be true of certain mental operations—the Peripatetics, I believe, carried on their disputations while walking to and fro — it is certain that for profound thought the muscular system must be in repose. Violent exercise and sustained intellectual effort cannot take place at one and the same time, and not only so, but prolonged daily muscular toil is unfavourable to the higher forms of mind-development. Exercise is, in fact, unfavourable to subjectivity of thought—*i.e.*, it prevents the individual from withdrawing into himself, the degree to which it does this being in proportion to its violence and its difficulty.

Now, the more an exercise needs the co-operation of the will, the more exhausting is it to the nervous system, and the more depressing is its effect upon the emotions; while the more automatic the exercise—the more independent, *i.e.*, of the higher cerebral centres—the less exhausting is it and the more likely to exhilarate. Thus

fencing, which keeps the higher centres constantly on the alert, is highly exhausting, while that favourite pastime of youth, swinging, or rather being swung, is, to many at least, purely exhilarating.

In like manner riding causes greater exhaustion in the inexperienced than in the expert rider, with whom it may be purely automatic; and the same is true of dancing, skating, and similar exercises. It is the mental effort of the performer which exhausts. Walking is, for the most part, purely automatic, but, as Legrange observes, if the pace is considerably less or greater than the customary one, the exercise ceases to be automatic and becomes correspondingly exhausting.

When, therefore, we prescribe exercise for a patient with nervous exhaustion, especially one suffering from brain-fag, we should order easy automatic exercises, such as walking at the accustomed pace and cycling, rather than those which, like fencing, require concentrated attention. These latter we should order rather for the listless and lethargic.

It should be remembered that exercises of speed are much more exhausting to brain and spinal cord than exercises of strength, just as they are less conducive to muscular development. Thus navvies and porters are generally stoutly built, while runners, fencers, and dancers are of slighter make.

Even an easy automatic exercise, like walking, becomes exhausting to the nervous system when persisted in after the muscles have become greatly fatigued; for the more fatigued the latter, the stronger is the nervous impulse needed to contract them. As they flag they require to be whipped up by an extra stimulus (just as happens in the case of the electrical stimulus), and this leads to exhaustion of the neurones.

CHAPTER XXIV

EXERCISE NEEDFUL FOR NORMAL HEALTH

It is quite impossible for the young human being to develop as he should if his muscles are not properly exercised. Whatever may be true as regards the fully developed organism, it is certain that the muscles should be constantly brought into play during the years of growth and development; otherwise we get defective muscles, defective skeleton, defective growth generally—in short, a stunted being. The need for muscular activity at this time is shown by the instinctive promptings to it observed in all healthy and vigorous young animals. Children, like the rest, indulge in exercise from sheer pleasure in it, and indeed begin to exercise their limbs before they are yet born.

It is true that some children are comparatively inert, not caring to join in the games of their playmates, and choosing rather to amuse themselves quietly with their elders; but such children are always abnormal: they lack vitality, are of a solitary or preternaturally studious disposition, or suffer, it may be, from some actual physical defect; and though it must be admitted that they sometimes live to grow old, they never reach the highest level of health, passing their lives on an altogether lower health-plane than their more vigorous companions.

It once fell to my lot to coach for one of the services a man of diminutive physique but brilliant mental attainments. As a child he had shown unusual ability, and it became his father's ambition to educate his mind to its furthest limits and make a great man of him. Accordingly he kept him perpetually at his books, begrudging every hour spent at play. The result was that the lad grew up a small, delicate man, with a brain developed out of all proportion to the rest of his body; his limbs were small, his muscles feeble, his skin thin and transparent, his hair fine—he was, in short, like some delicate hot-house plant. As showing that this exclusively mental training was utterly alien to his instincts, this young man's dream was of a career in one of the services, and so well had he worked to this end that when he came to me I fully expected him to get in first. But alas! he failed to pass the preliminary physical examination; not that any actual disease could be detected, but it was held that he was too small and too delicate to wear the King's uniform. His rejection was a most cruel disappointment. I well remember, when he came to tell me the result, how bitterly he reproached his father for neglecting to train his body as well as his mind, thereby, as it seemed to him, irretrievably wrecking his career.

TYPES OF NATURAL EXERCISE.

What are the most "natural" of all exercises? How does a man work off his energy, if placed under natural conditions and left to obey his instinctive promptings? To this question, worthy of consideration because we may be sure that the most natural exercises are the most conducive to health, we shall best obtain the answer by studying the activities of children.

When children are left to themselves, we find that their

muscular activities consist mainly in walking, running, jumping, dancing, and climbing; we further notice that none of these actions are continued for any length of time, but that they are taken up spasmodically in short, sharp bouts, separated by intervals of comparative inaction. Thus in such a game as "chivvy," in which a definite objective adds zest to the enjoyment of the exercise, the natural prompting to sudden outbursts of energy finds free expression, and it and kindred games are consequently favourites.

In adult life the same tendency to spurts of activity is observed, though the spasmodic character of the movements engaged in is less marked. There is now greater capacity for continuous effort, which finds its most natural expression in hunting and primitive warfare, and, in a later stage of evolution, in athletic amusements generally. There is, however, no natural prompting to *continuous* muscular toil. It is only within a comparatively recent stage of his philogeny that we find man engaged in this, and it is not therefore surprising that it is generally irksome to him, especially at first, and that he only perseveres in it because compelled by necessity. Nor is continuous muscular labour merely irksome; too often it is actually injurious. Moderate agricultural labour does not harm a strong, healthy man; but long-continued, heavy toil, like that of the navvy and the miner, and all occupations involving violent strain, such as hammering and lifting heavy weights, are necessarily injurious to the circulatory system and tend to shorten life.

I would further emphasize the fact that man is not built for fleetness of foot or great physical strength, and I do this because there is at the present time a desire to excel in both: every young man would like to be a famous runner, or a "strong man," and to gain either of

these ends he is willing to go through prolonged training and to put himself to great inconvenience. Witness, *e.g.*, the present craze to procure enormous muscular development. I feel convinced that it is a mistaken aim, and I earnestly hope that our profession will not lend their countenance to it. Man, I say, is not built either for fleetness or for brute strength, neither of which avails him much in the struggle for existence. In that struggle he has had throughout to depend chiefly upon his mother-wit, and thus his muscular system has come to be adapted rather for carrying out the purposes of a resourceful mind than for feats of strength or fleetness. In the matter of locomotion, indeed, man labours under serious disadvantage. Built upon a longitudinal plan, he actually progresses upon one end of his long axis! Is it, then, surprising that, handicapped like this, he displays little skill or grace in running, and that he is a very tortoise compared, say, with the rabbit, an animal less than one-fiftieth of his weight? Why therefore seek to excel where real excellence is in the nature of things impossible? Similarly in regard to strength of muscle. Man, I repeat, is not built for great strength. A small pony can do more work in a day than half a dozen strong men. There is no advantage in developing the muscles inordinately: for lifting and carrying heavy weights we employ machines and beasts of burden, not men. Moreover, such inordinate muscular development detracts from a man's efficiency in other respects, rendering him less agile—muscle-bound, as it were—and by no means increasing his power of endurance. The professional "strong man" would cut a sorry figure if put to a hard day's work as a navvy; he, moreover, rarely attains old age. Nor does excessive muscular development add to his beauty. If I desire to see the human form in its

perfection, I go neither to the gymnast nor to the "strong man," but to the cricketer, the football player, and the runner.

We often hear of schemes for improving the physical development of school-children. It is sincerely to be hoped that all such schemes will be approved by medical men before being adopted.

VARYING NEED FOR EXERCISE IN DIFFERENT INDIVIDUALS.

Even during the years of development, when exercise is of such paramount importance, individual differences may be observed in regard to the amount needful to health; but when adult life is reached, these differences become much more marked, so that while we find some people wholly unable to adapt themselves to a sedentary mode of life and never well unless they have plenty of out-of-door exercise, we find others keeping at least moderately fit though taking next to none at all. These individual differences are probably more marked in civilized than in primitive man: the former is less dependent for health upon an active out-of-door life than the latter; for when civilized man had reached, the urban stage he was in large measure relieved from the necessity to lead an active, open-air life, and he had thus become to some extent adapted to a sedentary one. This process of adaptation is still going on, and is, as one might expect, more advanced in some than in others, a fact which helps to explain why muscular activity is no longer equally needful to all.

I have said that a life of inactivity is consistent with moderately good health. There are indeed those who stoutly maintain that it is possible to keep perfectly well without exercise, and they point triumphantly to their

own cases as showing how fallacious is the time-honoured notion that exercise is essential to health. They will tell us, for instance, that the only reason they walk upstairs or to their carriage is because they cannot well be carried.

In judging on this matter there are several things to be taken into consideration. In the first place, a man who closely applies his brain for twelve hours or more out of the twenty-four is less able to sustain, and less likely to be benefited by, vigorous exercise than the average working man. Experience has shown that when a man is working at high mental pressure it is generally wise to husband his muscular energy, although doubtless the health of such a man would be better if he used his brain less and were thus able to take more exercise.

Again, it has to be remembered that a person pursuing a sedentary occupation may be using his muscles far more than is always realized. He may do a great deal of standing or talking, both of which freely use up energy. I should say as much energy is expended in standing for an hour as in walking at a moderate pace along a level road for half that time; and talking, also, by its influence on the respiratory movements and the circulation, as well as by its stimulating effects upon the body generally, uses up more energy than *prima facie* appears. Nor must we forget that a considerable amount of energy may be expended in going upstairs, as the practitioner in busy practice knows very well. Another consideration of importance is the quantity of food that is being taken. A person leading a sedentary life does not need more than half the quantity required in a life of great muscular activity; and by limiting his diet to his requirements, the sedentary man may greatly diminish the evils resulting

from lack of exercise. It will, I believe, generally be found that those who boast that they can keep well without taking exercise are small eaters.

Finally, it must not be forgotten that the evils arising from a sedentary life may be unperceived, and we must not too hastily assume, because we hear no complaints of ill-health, that all is as well as it might be.

I think that the proper attitude to take up regarding the question of muscular exercise is this: while admitting that some are so constituted—and women more frequently than men—that they can maintain a fair measure of health though taking little or no exercise, especially if they eat moderately, it is at the same time very doubtful whether such live up to their full health possibilities; while as regards the vast majority of mankind, it is safe to say that a sedentary life necessarily goes along with indifferent health.

It is manifestly of great importance to be able to identify those for whom an active life is essential, but it is difficult to lay down rules on this head. Experience is in the last resort the only true test. This much is certain—that the gouty, the bilious, and the neurotic are especially apt to suffer from lack of exercise.

EVILS ATTACHING TO A SEDENTARY LIFE.

Among the many evils attaching to a sedentary life fixity of the chest is not the least. The respiratory movements being habitually shallow in those leading inactive lives, their range becomes permanently restricted and the chest fixed in a somewhat contracted position. It is quite remarkable how limited the chest-movements generally are in the sedentary, especially in women. Curiously enough, protracted violent exercise may have a similar

effect, though in this case the chest is fixed in an expanded, instead of in a contracted, position. The chief factor in causing this fixity in expansion is breathlessness, which excites the inspiratory muscles more than the expiratory: inspirations are full, expirations incomplete; hence the mean size of the chest is increased.

Another evil effect of a sedentary existence is atrophy of the abdominal muscles. Under normal conditions, and especially in the upright position, these muscles exert considerable pressure upon the abdominal contents, and such pressure serves two useful purposes: it helps to keep the abdominal viscera in their right position, and to prevent an undue accumulation of blood in the splanchnic veins. Women with weak and attenuated abdominal muscles, such as one so frequently observes in tight-lacers and multiparæ, are very prone to suffer from a downward displacement of the abdominal viscera with its attendant train of evils, and from a feeling of faintness due to an accumulation of blood in the splanchnic veins.

EXERCISE A SPECIAL NEED OF THE SEDENTARY.

In a state of nature every healthy animal may be said to be in perfect training; the conditions of the life, involving as they do continual activity, ensure this. If we examine a wild animal—a wolf or a hare, for instance—we shall find it in the very pink of condition; and the same is true of man in a primitive state. His muscles are hard, he has not an ounce of superfluous fat, and all the organs of his body are in perfect working form. In this condition of physical fitness the high-water mark of health is reached—the blood is then at its purest, resistance to disease at its strongest, the sense of well-being at its keenest. Thus it is that a man never feels so

buoyantly well as when in perfect training; then it is that merely to be alive is a joy.

It is needful to qualify the term "in perfect training." I do not mean by it that extreme degree of training considered needful for some great athletic contest, such as an inter-university boat-race. The condition then attained is in a measure abnormal, for it cannot be kept up for any length of time, the aspirant to athletic honours very soon getting "stale." I refer rather to that sustained state of fitness enjoyed by, say, the rancher, who can be in the saddle all day and undergo hardship and privation with a minimum of fatigue, not for a few days only but for years together.

It is of course impossible for the average civilized man to maintain so high a level of physical fitness as this. Those following outdoor pursuits under favourable conditions have the best chance, but these are the few. In civilized communities most are compelled to lead a sedentary life, or at any rate to spend much of their time indoors. Nevertheless, among such more may be done in the way of cultivating physical fitness than is done. Though all cannot attain to the perfection of it, all able-bodied persons can at least make an effort in this direction, and such of them as follow sedentary occupations should make a point of keeping themselves in some sort of training. They should not allow themselves to become fat and flabby. In saying this, I include the middle-aged and the elderly as well as younger adults. There are some who appear to think that it is quite in accordance with the fitness of things to become portly and sedate when middle life is reached, but this is by no means inevitable if due attention be paid to diet and exercise. Many men past the age of forty have performed great athletic feats, and though I do not cite the

fact in order to induce others of this age to emulate them, it serves to show that no man when he has reached forty need consider himself inevitably doomed to obesity and inertia. Let him aim at keeping up something of his old form and maintaining some of the slimness and agility of his younger years. These remarks apply, though not so forcibly, to women as well as to men.

As regards the best means of keeping the muscular system well developed, I am far from advocating extreme measures. We can never afford to sheathe the sword against fanaticism, and with exercise, as with all else, we want moderation, not excess. Such exercises as walking, cycling, horse-riding, combined with a wise use of light dumb-bells (1 to 3 pounds), are all that is necessary; or simple arm-exercises alone may suffice, the object being to bring into play the large muscles of the chest and those of the upper extremities, which otherwise are apt to get little exercise and in consequence to be ill-developed. It is astonishing what good results can be obtained by spending five or ten minutes in systematic exercise night and morning.

I have said that corpulency should be kept down by a due attention to exercise and diet. The influence of exercise in removing fat is well known, the fat being burnt off in order to provide fuel for the muscles; and, as one might perhaps expect, it disappears most rapidly from those parts where the muscles are most exercised, vanishing first from between the individual muscle-fibres, and next from the neighbouring regions. Hence, when an exercise involves a limited group of muscles more particularly, the fat does not simultaneously disappear to the same extent from all parts of the body. Fencing, *e.g.*, removes the fat chiefly from the upper extremities and the upper part of the body, so that we may

see a fencer quite lean in these regions, yet of very ample girth. On the other hand, it is possible by suitable abdominal exercises to remove abdominal fat without appreciably reducing the general obesity; and in this connexion it may be observed that gymnasts, in whom the abdominal muscles are wont to be enormously developed, are lean in the abdominal region.

THE EVILS OF EXCESSIVE EXERCISE.

We meet with excessive exercise in the case of certain laborious occupations, as those of miners, navvies, hammersmiths, etc., and in athletics carried to extremes. The most flagrant instances of this latter form of excess are afforded by the modern record-breaking mania and by the exaggerated spirit of emulation now pervading all forms of sport.

The evils due to excessive exercise may be classed under two heads. First, and most important, are those connected with the heart and blood-vessels, which are apt to be injured by all violent exercises. The danger is greater during adult, than during pre-adult, life, and increases with increasing years. During the years of development the heart and the aorta are peculiarly adapted to bear without injury the sudden strain put upon them by those spasmodic outbursts of energy which characterize this period of life. This is especially true of the aorta, which is then highly elastic and capable of withstanding sudden distension, and to a less extent it is true of the heart itself, though not infrequently that organ undergoes dilatation in the young from overstrain, as in young anæmic women who have to carry coals up several flights of stairs. There can be no doubt, too, that the severer forms of athletic contest often cause lasting injury to the heart, and were it not that such contests engender

a spirit of emulation which is at once a stimulus to excellence and a source of pleasure in itself, I should have little hesitation in proscribing them altogether. It is quite easy to secure proper development of the muscular system without striving after a dangerous excellence.

The second class of evils resulting from excessive exercise are associated with augmented muscle-katabolism. Over-work has a very definite effect upon the muscular system. Thus the muscle of a hunted animal which dies from exhaustion has certain definite characteristics: it is flabby, strongly acid, and loaded with extractives, and it tends moreover rapidly to be affected by rigor mortis, sometimes even before the heart has ceased to beat. These considerations explain why the flesh of hunted animals is tender to eat and why it putrefies rapidly.

Over-work, again, by causing the blood to be surcharged with poisons, may give rise to fever, a condition sometimes observed in over-worked soldiers (*e.g.*, artillerymen) and in competitors in long-distance athletic contests (*e.g.*, cyclists). It is interesting to observe in this connexion that sunstroke rarely occurs unless the muscular system has been greatly over-taxed, for which reason infantry are more liable to suffer from it than mounted men.

CHAPTER XXV

THE THERAPEUTICS OF MUSCULAR EXERCISE

It is matter for regret that medical men do not study muscular exercises from the point of view of their therapeutic value in a systematic, scientific way. Such study comes well within the province of the physician, whose knowledge of anatomy, physiology, and pathology peculiarly qualifies him to undertake it. As it is, the advertising quack is permitted to monopolize this important therapeutic field, and it is time that the profession made a stand against this state of things. The orthopædic surgeon prescribes definite exercises for definite purposes, and is in a position to teach them himself or to supervise those to whom he delegates the teaching; and what the special surgeon can do, that ought doctors in general to do also. We should not leave such a fruitful branch of treatment in the hands of the charlatan, who by smart business methods and skilful advertisement manages to extract from the public enormous sums of money, much of which might with greater propriety and justice go to swell the slender incomes of the men who at least take their profession seriously, and devote their lives to acquiring a true knowledge of the things that the quack handles so casually.

I doubt if our profession has anything like an adequate realization of the extreme ignorance of many of these quack teachers, and how liable they are through that ignorance to do harm. It is by no means rare for a person's general health to be injured by a course of their exercises, and I have even known deformities to be produced by them. Thus a patient of mine was made distinctly pigeon-breasted by a course of exercises in breathing. Often these people are not less audacious than ignorant. Not long ago a tall and fashionably-dressed woman paid me a visit, as she doubtless did many others, in order to vaunt her skill as a teacher of breathing exercises. She told me that she had read a book I had written on the subject, and that having herself studied the question independently, had arrived at conclusions of her own which had enabled her to produce striking results. Hearing all this, and being genuinely desirous to learn, I settled myself to listen attentively. My visitor very soon assumed the attitude of teacher to pupil, and proceeded to demonstrate some of her methods on my own person, seeking to explain them in language to me wholly unintelligible, and which was, in point of fact, sheer nonsense. Now, seeing that, armed with at least some medical training, I had spent two whole years in the humble endeavour to understand the various physical problems connected with breathing, and to devise exercises likely to be of therapeutic use, her behaviour was, to say the least, somewhat presumptuous. Yet this is the sort of person who is allowed to catch the ear of the public. I do not say that such people do no good—in certain cases almost any exercises are useful—but I do say that they often do harm, and that they arrogate to themselves functions which more properly belong to the medical man. It is he, if anyone, who is, or should be,

entitled to speak authoritatively on the subject of muscular exercise. Muscular exercises, including Swedish drill and massage, should be taught at hospitals, and every student should go through a course of them in order that he may understand at least the main principles which underlie them. The best time for doing this would be during the dissecting-room period, when the attachments and actions of the various muscles are being studied.

In order to show how necessary it is to know something of anatomy and physiology before attempting to teach intelligently even the simplest exercises, I may refer to the subject of breathing in singing. I have never heard, or read, any intelligent or intelligible description by singing-masters of the different kinds of breathing which may be employed in singing, nor why one should be adopted rather than another. One eminent teacher of singing gravely propounded to me the theory that the diaphragm was not an inspiratory muscle! The amount of nonsense which has been written and spoken on the subject is truly amazing. And all this arises from an ignorance of anatomy and physiology.

KINDS OF EXERCISE.

Exercises of the legs, such as walking and running, lead, owing to the massiveness of the muscles mainly involved, to a far greater expenditure of energy than arm-exercises, and thus much more energy is expended in running, skipping, dancing, going upstairs, or climbing a hill, than in dumb-bell and gymnastic exercises, in which the arms are made to usurp, as it were, the office of the legs. Strange as it may seem, a child expends more energy in running about than in using heavy dumb-bells or performing on the horizontal bar.

It is a mistake to suppose that because certain gym-

nastic exercises are difficult therefore they involve the expenditure of much energy; they often depend upon knack rather than strength, and when once the knack has been acquired, a feat which at first proved very difficult may be performed with the greatest ease and with the expenditure of a comparatively small amount of force. Such exercises are far less useful than those requiring speed and endurance.

We may now briefly refer to some special exercises.

Standing, though not generally considered in the light of an exercise, nevertheless involves, as we have already seen, the expenditure of a good deal of energy. The fatigue which it causes is, however, altogether out of proportion to the energy expended, and I believe the chief reason of this is that the blood tends, during the upright position, to gravitate into the dependent parts of the body. In walking, especially in walking fast, and *a fortiori* in running, this tendency is less pronounced, owing to the favouring influence on the upward blood-flow of rhythmic muscular contractions.

The influence of gravity on the circulation is antagonized by certain compensatory mechanisms (which have been carefully studied by Leonard Hill), and in vigorous health these may hold out for some time, even in the standing position; but with some, and especially those in feeble health, they are inadequate, and this is one of the reasons why these persons are so much more readily fatigued by standing and walking than others. People with this peculiarity should adopt a form of exercise in which the sitting posture is assumed, such as cycling, horse-riding, or sculling.

The influence of climatic conditions as regards fatigue may be at least partly explained on similar lines. It is well known that in dry, cold, "brisk" weather standing

and walking are less fatiguing than in warm, moist, "relaxing" weather. This is probably because in the former the arterioles are contracted and the blood thus kept from draining into the dependent veins, while in the latter the arterioles are in a more relaxed condition.

Cycling differs from walking in that it demands very little expenditure of energy in maintaining equilibrium. In walking on the level much more energy is expended in maintaining equilibrium than in carrying the body forward, for with every movement of the legs the centre of gravity tends to alter, and this alteration has to be met by definite muscular contractions; and when we reflect that to maintain the upright position at all almost every muscle of the neck, trunk, and legs has to be contracted, it is obvious that the maintenance of the balance alone involves the expenditure of no small amount of energy. Now, practically the whole of the energy thus used up in walking is in cycling available for forward progression.

It will of course be clear that, since cycling involves a much more limited set of muscles than walking, the latter, as a means of exercising the muscular system at large, is certainly the better exercise. From the health standpoint there is indeed no exercise comparable with walking. In aged and delicate people, and in all cases in which it is eminently desirable not to over-tax the heart and lungs, it is *par excellence* the exercise. Its drawback is that when undertaken as a strict duty it is apt to be uninteresting, but when it forms part of some engrossing pursuit, such as golf or shooting, or when a hobby gives it an aim, it is one of the most delightful, as well as the most beneficial, of exercises. There is moreover far less temptation to over-exertion in walking than there is in cycling, though it should not be forgotten that cycling can be made the gentlest of exercises—*e.g.*, along a smooth, level road with no antagonistic wind.

On the advantages of horse-riding it is not needful to insist. Unfortunately, all cannot afford the luxury, and of those who can some are unable to learn to ride, even though they begin early in life. On the other hand, many make capital riders though they never mount a horse until past forty; and, circumstances permitting, I never hesitate to advise patients of this age to learn, if the exercise is indicated therapeutically.

Riding calls into play practically all the muscles of the body. It stimulates the circulation, stirs up the liver, excites the activity of the skin, and produces a feeling of exhilaration. In prescribing it, however, we must be careful to define accurately the extent to which it should be indulged in; for while gentle horse-exercise on a comfortable horse involves little or no strain on the heart, cross-country riding constitutes one of the most violent of exercises—so violent, indeed, that the rider may be spent before his horse.

Some of the mildest forms of exercise we can prescribe are walking at a moderate pace, cycling along a level road, and gently rowing down-stream.

SPECIAL EXERCISES FOR DEVELOPING THE MUSCLES.

Much may be done to develop the muscles by simple exercises without the use of apparatus, such as movements of flexion, extension, abduction, rotation of the trunk and limbs; or special apparatus may be used, such as dumb-bells and the popular Whiteley's, or Sandow's, "Exerciser." The physician will have no difficulty in prescribing suitable exercises for his patients, the object being to secure an equable development of all the muscles, and not an excessive development of certain groups—*e.g.*, those of the upper extremities—such as gymnastic exercises tend to produce.

CHAPTER XXVI

RULES TO BE OBSERVED IN PRESCRIBING EXERCISE

In prescribing exercise we must be careful to adjust the kind and the amount to the requirements of the case. Thus we have to consider age, sex, the state of nutrition, the amount of food taken, and the condition of the heart, lungs, and kidneys.

A very good general rule to give patients is this: all exercise short of that which produces fatigue, decided palpitation, or breathlessness, is useful. The young and vigorous may not be harmed by the induction of these symptoms, but the aged (and even the middle-aged), the weakly, and those suffering from heart or lung disease, certainly may be.

We may further have to point out that though exercise is admirable when kept within proper limits, it is a mistake to become slavish devotees to it. Some people imagine that, come what may, they should take a prescribed amount daily; others appear to think that the more they manage to get in the better—that every extra yard they walk, for instance, is so much put to their account. In this way many do themselves more harm than good, and I have often known patients take a lot of exercise when what they really wanted was complete

rest. This is especially liable to happen with ill-nourished neurotics, and those of a highly katabolic type.

Let us now turn to some of the factors which should guide us in individual cases.

AGE.

We have seen that during the years of development there is in all normal persons an instinctive prompting to muscular activity. This prompting takes the form of sudden outbursts—spurts—of activity, such as running and jumping, modes of activity which find a place in most of the outdoor games of youth. The young growing human being is much less capable of steady, continued exertion calling for endurance than the adult, who on his part is less addicted than the child to spasmodic outbursts of energy. When adult life is reached, in fact, the muscular system is more disposed to quiescence than in the developmental period, which fact we may take to imply that the need for activity, especially in its more violent forms, is not then so imperious. It is curious, however, that in many women the instinctive prompting to an intense form of muscular activity survives for years after they have reached maturity in their love of, and capacity for, dancing.

Guided by these considerations, we recommend for young people short, brisk exercises, such as skipping, dancing, running, tennis; none can compare with these for securing normal development—above all, development of the thorax. Exercises demanding great endurance, such as long-distance running and muscular toil, we discountenance for the very young. When full maturity is reached they can, with reservations, be allowed, but we have then to caution against all *sudden* and violent

muscular effort, and especially in the case of the middle-aged and elderly, for fear of injury to the heart and the aorta. Then is the time for golf, moderate cycling, and gentle riding, and our older patients should be warned also not to over-exert themselves when shooting or hunting.

SEX.

The factor of sex comes in for consideration in relation to exercise. In their admirable work on "The Evolution of Sex," Geddes and Thompson lay great stress on the anabolic tendency of the female organism as contrasted with the katabolic disposition of the male, the one tending to store up, the other to expend, energy. Before puberty these differences are not marked, the girl, like the boy, being katabolically inclined, though not quite to the same extent, and she should then be encouraged to lead a life scarcely less active than that of the boy, avoiding only his more violent exercises. As womanhood is approached, however, the anabolic disposition begins to assert itself; there is an increasing tendency to the laying on of fat, to the storage of energy, to inertia, thus foreshadowing one of the essential functions of the woman — the storing up of nutriment for the young; and thereafter the need for activity in the woman, though this is still desirable in moderation, is less imperative, especially during the periods of gestation and lactation.

Active exercise, therefore, is less needful in the case of the woman than of the man.

THE STATE OF NUTRITION.

For the obese we prescribe plenty of exercise in order to burn off the excess of fat, being careful of course not to put too great a strain on the heart. When, on the

other hand, the weight is below the normal we limit the amount of exercise, in extreme cases debarring it altogether.

Much exercise is always detrimental in anæmia. When the condition is extreme, rest in bed is indicated. Every physician is familiar with the beneficial effect on chlorosis of simple rest in bed, such exercise as is allowed being very gentle, owing to the great tendency to palpitation and breathlessness. Respiratory exercises are of special use in this complaint.

Convalescents should of course be allowed none but gentle, easy exercise.

THE AMOUNT OF FOOD TAKEN.

Another factor which it is very necessary to take into consideration in prescribing exercise is the patient's diet. Other things being equal, the more substantial the diet the greater should be the amount of exercise; and conversely, on a scanty diet the amount of exercise should be correspondingly small. A person who is training, or undergoing any severe muscular exertion, requires to be well fed; otherwise he will suffer from exhaustion, besides running great risk of injuring his heart which, if ill-nourished, is very apt to suffer from strain. But while he should be well fed, he does not necessarily require large quantities of food: the researches of Chittenden tend to show that both soldiers and athletes do well on less food than has generally been thought requisite.

THE CONDITION OF THE HEART.

Contrary to popular belief, all exercises are beneficial in heart disease so long as they do not produce troublesome palpitation or breathlessness. When compensation

is complete, or but slightly at fault, even exercises which produce these symptoms are, before the degenerative period of life, and especially in mitral disease, permissible within limits. In aortic regurgitation, however, even in young subjects with complete compensation, we are more cautious in allowing them, though they may often be undertaken in moderation without any apparent harm. When, on the other hand, compensation is not complete, and when the degenerative period of life is reached, we are very chary in permitting exercises which, by straining the heart and the lungs, cause breathlessness and palpitation; and in no case more so than in degenerative disease of the aortic valves, or when we have reason to suspect diseased coronary arteries. Sudden violent exercises are then fraught with the gravest danger. Nevertheless, I have seen cases of this kind greatly benefited by steady, sustained exercise.

DISEASES OF THE LUNGS.

Acute pulmonary disease demands rest, while chronic affections of the lungs, except the very mildest, only permit of moderate exercise, for anything beyond this produces marked breathlessness, and breathlessness in any but a slight degree is injurious in all forms of pulmonary disease, owing to its tendency to induce emphysema, or to aggravate this condition when it already exists. An emphysematous patient should be cautioned never to do anything to get himself out of breath.*

But where the lungs are merely ill-developed and not diseased, exercises which induce breathlessness are of the greatest benefit. They are also useful in cases of spasmodic asthma, provided there is no organic disease of the lungs.

* See "Respiratory Exercises," by the writer.

DISEASES OF THE KIDNEYS.

Sufferers from Bright's disease do not tolerate exercise well. Not only does exercise aggravate albuminuria, but it puts extra work on the heart, which in this disease, and especially in the late stage of granular kidney, is apt at all times to be over-taxed.

Some have advocated abundant exercise in diabetes; moderation should, however, be counselled.

CHAPTER XXVII

THE THERAPEUTICS OF REST

On this subject I shall be very brief. The need of rest in such affections as pneumonia, enteric fever, anæmia, neurasthenia, aneurism, and failing heart, is well known, as is also the importance of keeping a patient with a rheumatic heart in bed until full compensation is re-established; of not allowing a patient with a mild attack of scarlet fever to get up, no matter how well he seems, until all danger of nephritis is past; and of not over-taxing the heart during convalescence from acute fevers. These are indeed mere truisms.

The urgent need of securing as much rest as possible in cases of extreme dyspnœa is not, however, so generally recognized. This is because in dyspnœa every movement makes fresh demands upon the respiratory muscles, and the more the muscular system is taxed, the greater will be the craving for air. Unfortunately, the dyspnœic, even when remaining as inert as possible, is compelled by his laborious respiratory efforts to keep a large group of muscles in energetic action, and this not only for a short time but for days, and perhaps weeks, together; and in this way much more actual "work" is done than one is apt to think—the equivalent in the twenty-four hours, of, say, a seven or eight mile walk. No one who has

carefully watched the laboured breathing of the dyspnœic can well doubt this. We see, then, how needful it is in this condition to do all we can to spare the muscles.

Now, when dyspnœa is urgent, the semi-recumbent or sitting posture is assumed in order that the respiratory muscles may work at the greatest advantage, and the most effectual way of sparing them in this posture is to support the trunk *and the head* with pillows, so that the patient may not require to keep them up by muscular effort. Too little attention is paid to this latter point.

DEGREES OF REST.

We have to prescribe various degrees of rest, according to individual circumstances, from slight curtailment of the customary activities to almost absolute immobility. There are, in fact, many degrees of rest short of the absolute. Thus we may counsel the patient not to take any exercise out of doors, not to bustle unnecessarily about the house, to lie down for half an hour or so two or three times during the day—say, after meals—to retire early and get up late; or we may go the length of recommending an occasional day in bed. A very good day to choose for this, in the case of business men, is Sunday, and I have known several cases where much good has been done by spending it in this way. Again, we may confine the patient to bed for days or weeks, allowing him to sit up in bed and get out for necessary purposes; or, finally, we may have to insist upon the most absolute rest possible, as in severe hæmoptysis and the hæmorrhage of typhoid fever. The patient should then not be allowed to make the slightest movement and should have everything done for him.

REST DURING HOLIDAYS.

When we send a patient on a holiday it is important to caution him against over-exercise. People who go away for rest and change very often tire themselves out in this way. I remember two students who had been working hard for an examination going to a remote seaside village for a holiday, which they spent in ceaseless boating, swimming, and walking, scarcely ever allowing themselves any rest, and this not from any instinctive desire for exercise, but from a mistaken belief that the more they took the better. The next year one of them went to the same place with a friend of less energetic disposition, and the two spent most of their time in lazing about, with far happier results than on the former occasion.

The same caution should be given with added emphasis when the holiday is to be spent in travel. On board ship there is little inducement to excessive exercise, and hence a long sea-voyage may often be recommended with advantage to those who need physical rest; but in travelling about from town to town sight-seeing there is small chance of obtaining it, and if rest is our object, we should ban land-travel.

And here let me observe that when sending a patient away for rest, it is desirable to give him very careful instructions regarding the amount of food he should eat. If he is below his normal weight and wants building up, we must recommend a liberal diet; otherwise, and especially if he has reached middle life, we should caution him against eating too heartily. The temptation to eat too much on a holiday is sometimes great, and to yield to it may be to defeat the good that would otherwise accrue from the rest and change.

THE VARYING ABILITY TO REST.

In connexion with this subject of rest it is well to remember that some experience much greater difficulty in resting—*i.e.*, relaxing their muscles—than others. We all know people who must for ever be on the move; they cannot allow themselves a moment's complete repose; even when they sit down they are perpetually wriggling, grimacing, twitching, jerking. This form of restlessness is so obtrusive that it cannot well escape notice; but it may so happen that though a person is able to keep still, he yet cannot relax his muscles adequately, but must needs keep them in a state of marked tonic contraction. Observe how some while sitting keep the body bolt upright, thereby necessitating almost as much contraction of the trunk-muscles as when standing. We sit down to rest, and if there is no support to the back a somewhat huddled-up posture should be assumed, with the back well arched. This may not be graceful but it is physiological, and it is the attitude which a tired child instinctively adopts while sitting. There is no danger of its causing round shoulders if the muscular system is properly exercised. Again, few people when they sit with a support to the back take full advantage of it and relax the muscles to the utmost; on the contrary, they keep them unnecessarily rigid, and by no means secure all the rest possible. If the seat is comfortable—a comfortable arm-chair, for instance—it is possible effectually to rest all the muscles of the trunk, and it is well to get into the habit of doing this.

The degree to which the muscles are relaxed in the horizontal posture varies considerably under different circumstances. During profound, dreamless sleep they are relaxed to their utmost physiological extent. In complete chloroform narcosis and in the typhoid state relaxa-

tion may go even beyond this; and between such extrem relaxation and the degree of relaxation that occurs, *e.g* when an individual is lying on his side reading, there ar many grades. Now, as in sitting, so in lying down individuals differ considerably in their ability to rela their muscles. Some can relax them more or less com pletely, others seem quite unable to secure anything lik full relaxation. If while they are lying down a limb i lifted up, it is felt to be rigid, and it will often be observe in such cases that the brows are knit from contraction o the frontal muscles.

Patients of this kind should learn to relax thei muscles, while the fidgety and restless should cultivat composure and deliberateness in their movements.

CHAPTER XXVIII

PROTEIDS, SACCHARIDES, AND FATS

In a work like the present it is not possible to give a complete account of dietetics, and as I am only able to deal with certain limited portions of this branch of therapeutics, I shall select those to which I have given most thought, and on which, therefore, I shall be most likely to throw light. My aim will be to enunciate certain broad principles regarding which some sort of general agreement may be looked for among medical men. It will be no small gain when the whole medical profession is ready to subscribe to a number of well-attested dietetic principles. Not until then will dietetics have attained to the dignity of a science. A science implies the formulation of a number of propositions having such a show of truth as to be accepted by all its serious students; and applying this test, it is doubtful whether we are justified in including dietetics, or, for the matter of that, even general therapeutics, among the sciences, for there is scarcely a disease concerning the treatment of which physicians are in anything like accord. Therapeutics can never, it is true, become an exact science, since it is always the individual patient rather than a stereotyped disease that has to be treated. Nevertheless it is much to be regretted that physicians are not one and all

agreed on elementary principles, instead of each going his own way in treatment, to the bewilderment, and sometimes, I fear, the amusement, of the general public. In nothing does the unsatisfactory state of present-day therapeutics more painfully show than in the hopeless disagreement that prevails regarding the dietetic treatment of disease.

Before we can enter upon this subject it will be necessary to refer to a few facts concerning the various food-stuffs.

THE COMPOSITION OF FOOD.

Besides oxygen, the animal organism needs for its sustenance:

Organic Substances, yielding energy by their oxidation.	*Proteids.*—Essential to the generation and regeneration of bioplasm. *Saccharides.* *Fats.*
Inorganic Substances, not yielding energy by their oxidation.	*Salts.*—Essential to the nutrition of bioplasm. *Extractives.*—Stimulate the gastric mucous membrane and the nervous system generally. *Water.*—Essential to the bioplasm and to the circulation of the body-fluids. *Unabsorbable Material* (ballast).—Stimulates peristalsis.

The first three—proteids, saccharides, and fats—are organic substances of complex structure charged with energy, which energy they, by their oxidation, discharge in the form of heat, work, nervous energy, etc.

The *proteids*, as their name implies, are pre-eminent in importance, for to them belongs the distinction of supplying the material of which bioplasm is built up.

The *albuminoids* are allied to the proteids, but, though they yield energy by their oxidation, they cannot be built up into bioplasm.

The *saccharides* and *fats* can be dispensed with, for a time at least, possibly because they can both be formed from proteids; but the proteids, together with salts and water, are absolutely essential to life.

The *salts*, unlike the proteids, saccharides, and fats, do not furnish energy by their oxidation, but they play an essential, though ill-understood, part in the nutrition of the bioplasm: an animal fed on a diet from which all salts have been removed succumbs as soon as one from which food is entirely withheld.

The *extractives* consist for the most part of broken-down proteids. They tend to stimulate gastric digestion, and act (as I shall contend) upon the nervous system generally.

Water is a necessary constituent of the living tissues, making up about two-thirds of the entire body-weight, and it is further required as a vehicle for the circulation of food and waste-products, as a constituent of the secretions and excretions, and to provide for evaporation from the skin and respiratory tract, by means of which a super-heating of the body is prevented.

The *unabsorbable material*, or ballast, helps to stimulate peristalsis.

PROTEIDS.

Proteids are ingested chiefly in the form of native albumins — *e.g.*, myosin, egg-albumin, casein, gluten, legumen—the molecules of which are highly complex, often containing many hundreds of atoms.* By means of the digestive ferments these large molecules are split up into smaller ones, undergoing at the same time hydration, and forming the so-called derived albumins, much in the same

* The formula for hæmoglobin has been given as C_{712}, H_{1130}, N_{214}, O_{245}, Fe, S_2.

way as starch is by digestion split up into dextrins, maltose, and grape-sugar. The native albumin is first converted into acid- or alkali-albumin, and this, in its turn, into albumose, which, again, is changed into peptone.

The order here given also represents the relative absorbability of these substances, native albumin being the least, and peptone the most, absorbable. The fact that native albumin admits of absorption at all is of practical interest as showing that it may, in some degree at least, be absorbed even in the complete, or almost complete, absence of digestive juices, as, for instance, by the stomach in severe fever and by the rectum. By the addition of salt, which leads to the formation of alkali-albumin, and still more by peptonization, the absorption of proteid by the rectum may be helped considerably.

Some portion of the ingested proteid may in the process of digestion be broken down beyond the peptone stage into amido-acids (leucin and tyrosin), which are forthwith synthetized by the liver into urea; but it is probable that this only occurs after the ingestion of a large excess of proteid, when it is of advantage to the organism rapidly to get rid of the surplus nitrogen. Even under these circumstances, however, it is doubtful whether much proteid is reduced beyond the peptone stage.

It must not be supposed that the reduction of the food-stuffs during digestion into smaller and more diffusible molecules is for the purpose of allowing them to be absorbed into the blood by the simple process of diffusion. It is now known that the absorption of food is essentially a vital process, and that the disintegration effected by the digestive juices is merely for the purpose of facilitating this process by bringing the food-particles into more intimate contact with the bioplasm.

While both native and derived albumins admit of absorption as such, most of the proteid is absorbed as peptone, and but little, it would seem, as albumose. None, or practically none, is allowed to enter the blood as derived albumin, almost the whole of what is converted into this form being reintegrated by the epithelium of the alimentary tract (and by lymphocytes ?).

Only the barest traces of peptone and albumose are met with in the blood, these substances being, in fact, deadly poisons. Injected into the blood-stream in any quantity, they destroy its coagulability and cause a fatal lowering of the blood-pressure ; when injected in minute quantities, they are eliminated unchanged by the kidneys, showing that they are not assimilable.

When the digestive powers are very weak, and especially when the stomach is intolerant of food (as in fever, cardiac failure, and pernicious anæmia), it may sometimes be useful to peptonize the food; but, speaking generally, the administration of artificially-digested foods should only be resorted to in such extreme cases. The advantages of pre-digestion have been greatly overestimated; often more harm than good results from it.

SACCHARIDES.

The "saccharides" embrace starch, cellulose, the dextrins, and the sugars. They are more generally known as the carbohydrates, but I think it better to term them saccharides, since this name indicates their character, for they are all either mono-saccharides or some multiple of a mono-saccharide. They fall into the following groups :*

* Besides starch and its derivatives, allied substances are met with in the vegetable kingdom which, from our ignorance of their chemical nature and nutritive properties, I do not refer to in the text.

The mono-saccharides, represented by the formula x, include grape-sugar (glucose) and fruit-sugar (lævulose). A mixture of the two constitutes the "moist" sugar of commerce; honey consists of such a mixture with an added trace of cane-sugar.

The di-saccharides, represented by the formula x_2, consist of cane-sugar, malt-sugar (maltose), and milk-sugar (lactose).

The poly-saccharides, represented by the formulæ x_{10}, x_9, x_8, x_3, etc. These include starch, vegetable or animal (glycogen); cellulose, having the formula x_{10}; and a series of dextrins, with formulæ ranging from x_9 to x_3. Gum, as used on the backs of stamps, consists of dextrin, and the darker portions of bread-crust and of toast are rich in it.*

The mono-saccharides—grape-sugar and fruit-sugar—do not need digestion, their small molecules admitting of absorption as such, and the same appears to be true of the di-saccharide milk-sugar, the form, namely, in which Nature provides saccharide for the young mammal.

The large molecules of the poly-saccharides, on the other hand, are difficult of absorption, and the object of digestion is to convert them into a mono-saccharide. Thus the poly-saccharide starch, x_{10}, is broken down into dextrins of less and less complexity by the successive clipping off of an x radical until the di-saccharide maltose, x_2, is produced, most of which is then converted into the mono-saccharide grape-sugar, x_1.

* For the sake of simplicity I assume x to be exactly the same in each of the above cases. The amount of H_2O, however, associated with the x radical is not the same in all, increasing in the descent from the poly- to the mono-saccharides. Thus starch $=(C_6.H_{10}.O_5)_{10}$; cane-sugar $=(C_6.H_{10}.O_5.)_2H_2O$—*i.e.*, $C_{12}.H_{22}O_{11}$; and grape-sugar $=(C_6.H_{10}.O_5)H_2O$—*i.e.*, $C_6.H_{12}.O_6$.

Starch digestion is effected by the saliva and the pancreatic juice. It is important not to underestimate the power of the former in this direction. When the starch is thoroughly insalivated by mastication, salivary digestion proceeds much further than is generally supposed, though not, or very little, beyond the maltose stage.

Starch may be predigested by means of pancreatic or malt diastase, forming dextrins and maltose. Mellin's Food is a completely malted food, and may in fact, as R. Hutchison observes, be "regarded as a desiccated malt extract." The malt extracts (made by evaporating "malted barley"—*i.e.*, barley in which the starch has been changed into maltose by the diastase which develops in the grain during germination) consist of almost pure malt-sugar, and thus may be regarded as predigested starch. Many of the patent farinaceous foods are similarly predigested—some more, some less.

Benger's Food consists of wheaten flour mixed with pancreatic extract which, in the preparation of the food for use, converts the starch into dextrins and maltose while at the same time it effects some digestion of the proteids.

The di-saccharide cane-sugar, in spite of its comparatively small molecule and its high diffusibility, is only to a slight extent absorbed as such, thus showing, what has already been pointed out in regard to proteids, that the absorption of saccharides is not a mere matter of diffusion. Almost the whole of the cane-sugar which reaches the small intestine is converted by the succus entericus into invert-sugar (*i.e.*, a combination of grape-sugar and fruit-sugar), or what is practically honey. This substance, therefore, requires little or no digestion.

Most of the maltose undergoes a similar change.

The poly-saccharide cellulose, which can be converted

into maltose and grape-sugar by the digestive organs of the herbivora, does not admit of digestion by man (see p. 299). It is for this reason that many vegetable foods containing an abundance of proteids and starch encased in cellulose capsules are practically useless in their raw state as human foods, only yielding their nutriment after prolonged mastication, or after the capsules have been broken up by cooking.

The relative absorbability of the various saccharides is, as nearly as can be estimated, as follows, beginning with the least absorbable: native starch, starch-jelly, dextrin, cane-sugar, maltose, milk-sugar, fruit-sugar, grape-sugar, the last three being absorbable in about equal degrees. Very little of the ingested saccharide escapes absorption, practically the whole of it, with the exception of the undigestible cellulose, being taken up by the blood.

Cellulose. — This substance, which has the same empirical formula as starch, is dietetically of great importance, and this for two reasons — first, because it imprisons the nutriment (proteids, fats, starch) of the plant, and secondly, because man has little, if any, power of digesting it.

In order the better to understand these facts, it will be needful to touch on certain points in vegetable physiology. Vegetable, like animal, tissue is made up of cells. These, in the first instance, consist of minute masses of bioplasm devoid of a limiting membrane; but very soon the outer portion of each cell becomes converted into cellulose, and the cellulose walls of adjoining cells running together, a framework is formed, constituting the connective tissue of the plant. Within this cellulose framework proteids, fats, and saccharides are elaborated by the bioplasm, certain cells being specialized for their abundant formation and storage, such cells being sometimes so packed

with one or other of these food-stuffs as to render the bioplasm invisible; the cells of the potato tuber, *e.g.*, contain abundance of starch, those of nuts are rich in fat, while the seeds of the pulses and cereals contain a large proportion of proteid. The nutriment which man derives from the vegetable world thus consists essentially of the supplies which the plant has stored away for its own use or for that of the embryo.

We see, then, how it has come about that the proteids, fats, and saccharides of plants are locked up in a many-chambered prison of cellulose. The soluble saccharides—*i.e.*, the sugars—are readily diffused through the cellulose membranes, but the imprisoned proteids, fats, and starch cannot escape in this way; they can only be rendered available as food for animals by a rupture or solution of the cellulose walls.

As the cell increases in age the cellulose undergoes certain changes. These may be either of two kinds: (1) It may be converted into allied substances. Thus it may be changed into pectose; or it may become cuticularized and rendered impermeable to water from conversion into suberine and kindred substances, as happens in the epidermal cells of leaves and in the cells of cork; or, again, it may become lignified from conversion into lignin. (2) It may be impregnated with mineral substances, such as silica and calcium salts, and this to such an extent that, after burning the tissue, a skeletal outline of its structure is left by the ash.

Cellulose may thus be modified in an infinite variety of ways for the purpose of subserving different functions, and accordingly there exists an infinite variety of cellulose substances, affording wide scope for chemical investigation. For our present purpose it will suffice to divide them into two great classes:

1. The fibrous forms, which subserve a mechanical function only, and which the plant is unable to dissolve by ferment action. Such are wood-bark, the cuticle of leaves, cotton cellulose, and bran (the husk of corn). In all these cases the cell-bioplasm has disappeared and the cellulose walls have been converted into lignin, suberine, and the like; while in some, as bran, a deposit of mineral matter has also taken place.

These fibrous forms are largely employed in the arts, their value depending upon the resistance which they offer to chemical reagents: from them even the herbivora are unable to extract nutriment.

2. The non-fibrous forms, which the plant is capable of dissolving by ferment action. These are useful to the plant, not only as forming a mechanical framework for its tissues, but also as constituting a store of nutriment. The cellulose of grain—I refer to the portion contained within the husk—affords a case in point. During the germination of the grain diastase is, as we know, produced for the purpose of converting the insoluble starch into soluble sugar; but, not being diffusible, it cannot pass through the cellulose walls of the chambers enclosing the starch-grains. In order to reach these, the cellulose walls must first be dissolved. This solution, as Brown and Morris have shown, is effected by a special ferment, and the cellulose is converted into a soluble saccharide, which is needed for the nutrition of the embryo. These investigators have isolated this ferment from malt, and have, moreover, shown that it has the power of dissolving the cellulose of the potato, apple, turnip, carrot, and beet. Another instance of the production by plants of a cellulose-dissolving ferment is afforded by the ripening of fruits, such as the apple, the solution in this case being helped by the acids present in the fruit.

We have now to inquire what change cellulose undergoes in the alimentary tract of animal organisms, and we may confine our attention to mammalian digestion. The fibrous forms cannot be digested by any of the mammalia, but the non-fibrous varieties are susceptible of a considerable degree of solution, especially in the case of the herbivora. The solution is effected in two distinct ways: (1) By the agency of bacteria, the products in this case consisting of simple chemical substances, such as CH_4 and CO_2, which are useless for the purpose of nutrition; and (2) by means of a ferment capable of producing soluble and nutritive saccharides. It might be thought that this cellulose-dissolving ferment is actually secreted by vegetable-feeding mammals, but it would appear from the observations of Horace Brown (the authority just quoted) that such is not the case, but that the ferment in question is identical with that already referred to as present in germinating grain, and is, in fact, yielded by the food itself, the digestive tract of vegetable-feeding animals merely affording the conditions suited to its development.

Now, if the herbivora do not secrete a cellulose-dissolving ferment, we may be pretty sure that man does not. Certainly human saliva possesses no power of dissolving cellulose, as my friend Dr. Thompson has shown, and we may regard it as certain that the pancreatic juice is equally ineffective in this respect. Whether man, like the herbivora, is capable of causing the ingested vegetable food to yield up the solvent ferment within the digestive tract is matter for speculation, but even so it could only be available in the case of raw food, inasmuch as no ferment can develop in food when cooked. In the case of wheaten flour, moreover, that portion of the grain which yields the ferment—*i.e.*, the

embryo—is generally removed. We may, therefore, conclude that man—civilized man, at all events—derives no nutriment from cellulose, such disappearance of this substance as takes place in his alimentary tract being due to a bacterially induced decomposition. And as the decomposition takes place comparatively low down in the alimentary tract—too low for the liberated proteids, fats, and saccharides to be adequately absorbed—it is obvious that man must rely on some other method of breaking up the cellulose framework of vegetable tissue if he is to avail himself to the full of its nutrient contents.

What he actually does is to effect a mechanical rupture of the cellulose before it enters the stomach. This may be done in one or all of three ways: (1) By mastication, (2) by cooking, (3) by milling or grinding.

1. *Mastication.*—This constitutes Nature's own way of breaking up the cellulose framework and liberating the contained food-stuffs. One of the purposes of mastication is to facilitate the act of swallowing, but a far more important end served by it is the thorough comminution of the food in order that the digestive juices may percolate it freely, and to this end it is above all necessary that the cellulose framework (especially the fibrous forms), which does not admit of solution, should be well broken up. The carnivora do not masticate in the proper sense of the term, such molars as they possess being rather for the crunching of bones than for the breaking up of flesh. Throw a piece of meat to a dog, and he swallows it with little or no preliminary chewing. On the other hand the herbivora, in spite of the fact that they possess considerable power of dissolving cellulose, are one and all laborious masticators. Thus the horse subjects its food to prolonged dental grinding, especially if, like hay and oats, it contains

much insoluble cellulose. Some horses masticate better than others, and it is found that the more thoroughly they masticate the better they digest their food. If a horse bolts its corn a considerable quantity passes through the alimentary tract unchanged, owing to the insolubility of the dense cellulose husk, for which reason it is often found advisable to crush the oats before use.

That the prolonged mastication of the herbivora is to facilitate digestion rather than swallowing is shown by the curious practice of rumination common in many of the vegetable feeders, a process in which food already swallowed is regurgitated, to be thoroughly chewed at leisure, and this, be it noted, by animals possessed of a stomach affording special facilities for the solution of cellulose. There can be little doubt that rumination is essentially for the purpose of mechanically breaking up the more insoluble forms of cellulose, in order to liberate the whole of the contained nutriment; and if such prolonged mastication is necessary in the case of animals possessing the power of dissolving this substance, how much more need has man, who has little or no power of digesting it, thoroughly to masticate his raw vegetable food, if he is to liberate the imprisoned nutriment sufficiently high up in the digestive tract to be made of adequate use. For, as we have seen, such solution of cellulose as is effected by bacterial action takes place low down in the alimentary canal. We may therefore safely conclude that, *previous to the discovery of cookery, man, in so far as he was a vegetable feeder, was a laborious masticator.*

This brings us to the second of the mechanical means by which man breaks up the cellulose framework of his vegetable food.

2. *Cooking.*—It is usual to think of cooking as the art by which food is made more palatable; but its really important effect, at any rate as regards vegetable foods, is the rupture of the cellulose chambers in which their nutriment is confined, the contained starch grains swelling up under the influence of heat and thus bursting their cellulose prisons.

3. *Milling and Grinding.*—Lastly, the cellulose framework may be broken up, and the contained nutrient material liberated, by mechanical means such as grinding, a method which, I believe, man resorted to even before he learnt the art of cookery. Milling and grinding are of especial value in the case of grain, the cellulose framework of which is not so readily influenced by heat as is that of such a vegetable food as the potato, inasmuch as grain contains a considerable proportion of proteid (which, far from swelling up with cooking, actually contracts) and no very large supply of starch.

We have seen that the cellulose husk of wheat—*i.e.*, bran—is very resistant to chemical action. Wheaten bread, which contains some of this bran, is known as "brown" or "wholemeal" bread, and it is found that this kind of bread is not so completely absorbed as white bread, owing to the comparative indigestibility of the bran. The finer the wholemeal flour the greater the absorption; nevertheless, bread made with the finest wholemeal flour is not so completely absorbed as that made from white flour.

Sources of Cellulose.—The effect of cultivation has been to diminish the quantity of cellulose in our vegetable foods, and with certain exceptions (such as the husks of the grain of cereals and the fruit seeds of the raspberry, grape, fig, etc., which suffer little or no change in the

alimentary tract) it is now present in only very small proportions.

The actual amount of cellulose ingested even by vegetarians forms a very small proportion of the total weight of the food taken, and when we reflect that of this much of the non-fibrous variety is broken down within the alimentary tract by bacterial action, it is clear that no great amount of cellulose goes to augment the fæces, and, as a matter of fact, it constitutes but a small proportion of the fæcal mass. Is there, then, any truth in the common belief that vegetable foods owe their laxative action to the cellulose they contain? It is probable that at least they do in part, for though cellulose does not itself appreciably add to the bulk of the fæces, it increases them indirectly—first, by interfering with the absorption of the nutrients of vegetable food, especially the starch and the proteids, and secondly, by promoting a flow of alkaline secretion into the digestive tube, the effect of which is to neutralize the acids resulting from the fermentative decomposition of cellulose.

FAT.

Fat differs from saccharide in being a more concentrated food. It contains more unoxidized carbon and, weight for weight, yields two-thirds as much energy. It is therefore the most convenient form in which to store carbonaceous food in the animal organism which, though possessing great capacity for storing fat, has but limited powers of storing saccharide. It is noteworthy in this connexion that eggs, which in the interest of egg-laying species should obviously be as small as possible, contain the whole of their carbonaceous material in the form of fat, no saccharide whatever being present; and it is significant, too, that when in the vegetable kingdom there

is no urgent need to keep down bulk (as in the case of underground roots, tubers, etc., which, being hidden from view, offer no attraction to bird or beast), almost the whole of the carbonaceous food is stored as saccharide, and only an infinitesimal quantity as fat; while when it is needful, as in the case of nuts, to render the nutritive morsel as inconspicuous as possible, the carbonaceous food is present mainly as fat, nuts containing on an average 55 per cent. of fat and but 11·5 per cent. of saccharide.

Fat, then, acts as a store material; it moreover serves a useful mechanical function by furnishing a protective subdermal covering, and a padding for such organs as, *e.g.*, the eyeball and the kidneys. So much we know, but what part it plays in the nutrition of the bioplasm, or even if it is essential that the nutrient plasma should contain fat, we do not know. Whatever be the truth in regard to these points, it is nevertheless certain that the animal organism stands in need of it, not only for mechanical purposes, but also as a constituent of certain secretions.

This circumstance does not however justify us in concluding that fat is an indispensable article of diet, inasmuch as both proteids and saccharides are capable of furnishing it in abundance. We have, then, to ask if it is a matter of indifference to the organism whether it shall manufacture for itself all the fat it needs from these substances, or whether it is better that some fat should be ingested as such. About the answer there can be no doubt. It is certain that some fat should be included in the dietary, especially of the young; for apart from the fact that Nature provides the growing mammal with it in its mother's milk, experience shows that the human being, especially the young human being, suffers in health if the supply is inadequate, and improves rapidly as soon as the omission is made good.

The advantage of taking in fat as food when the organism can itself manufacture it, is perhaps partly to be explained by the gradual adaptation the digestive organs have undergone to a dietary containing it. Fat, abounding as it does in the vegetable kingdom and constituting a valuable source of energy, has from early times formed part of the dietary of animals, and that man, among the rest, has for uncounted generations consumed it in plenty is evidenced by his having subsisted during a considerable portion of his philogeny on a highly animalized diet. Even our pre-vertebrate ancestors were provided with special means for its digestion. Hence man's digestive system, adapted to a dietary containing fat, feels, so to speak, if it is omitted, with the result that digestion then fails to be carried out properly.

Exactly how the absence of fat interferes with normal digestion it is not easy to say. We know that it acts as a physiological laxative, and possibly it may, in some unknown way, aid the digestion of other food-stuffs; further, the inclusion of fat in the dietary diminishes the amount of saccharide needful, ¼ pound of fat being equal in energy-value to more than ½ pound of sugar, and experience shows that an excess of saccharide is injurious. Of late years the great cheapness of starch and sugar has tended, especially among the poor, to push the more expensive, and to many the less appetizing, fat out of the dietary, much to the detriment of health; for an excess of saccharide is liable to set up fermentative dyspepsia which may lead to many secondary evils.

These considerations may help to explain the great utility of fat—*e.g.*, cod-liver oil—in the treatment of the rickety and strumous. It seems clear that in both these conditions it benefits essentially by its influence on digestion, especially intestinal digestion: that such is the case

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in rickets is rendered almost certain by the fact that, far from there being a dearth of fat in this disease, rickety children are often weighted with a superfluity.

Normally, fat would appear to undergo little or no change in the stomach: owing to its light specific gravity it floats on the surface of the gastric contents, and is thus late in leaving that organ. It should therefore be taken rather at the end than at the beginning of a meal, and when administered medically in the form of cod-liver oil, olive oil, etc., it should be taken an hour or so after meals.

Fat is digested mainly through the agency of the bile and pancreatic juice, being absorbed chiefly, if not indeed entirely, not, as was once thought, in the particulate (emulsified) form, but in actual solution, chiefly as soaps, and to a less extent as fatty acids.

The quantity of fat which can be digested differs considerably in different individuals. Some there are who do not appear able to tolerate it in any but the smallest quantities, turning sick at the thought of even butter and cream. While allowing for these personal peculiarities, we must not forget the influence of habit, and hence the importance of early accustoming children to take fat. As regards the well-known ability of the Esquimaux to consume enormous quantities, there can be no doubt that cold weather creates a craving for it. This is abundantly testified by the experience of Arctic explorers.

The average daily quantity of fat that can be conveniently digested by the European is from 3 to 4 ounces. More than this is not absorbed and is apt to disagree.

CHAPTER XXIX

THE SUCCESSIVE CHANGES WHICH MAN'S DIET HAS UNDERGONE DURING HIS EVOLUTION FROM THE APE

THE most convenient method of denoting the successive grades, or stages, in man's evolution from his anthropoid ancestor is by reference to cranial capacity. Assuming the latter in the common ancestor of man and existing anthropoids to have been 300 c.c., and in the average European to be 1,500 c.c., we may mount upwards by successive grades of 100 c.c. to 1,500 c.c., or, striking out the noughts, from 3 to 15. Thus we may speak (see Fig. 1) of a third-, fourth-, and fifth-grade anthropoid, a sixth-, seventh-, eighth-, and ninth-grade homo-simian, and a tenth-, eleventh-, twelfth-, thirteenth-, fourteenth-, and fifteenth-grade man. Throughout all these stages the diet has been mixed, being composed partly of animal and partly of vegetable substances, the relative proportion of each varying with each evolutionary grade.

FOOD AVAILABLE FOR THE EVOLVING MAN.

Animal Food.—This included all kinds of animal food, from fish, birds, and birds' eggs, and every species of mammal down to frogs, lizards, snakes, shell-fish, worms, snails, insects, caterpillars, and grubs.

Honey, also, a quasi-animal food, has afforded a valuable nutriment from anthropoid times.

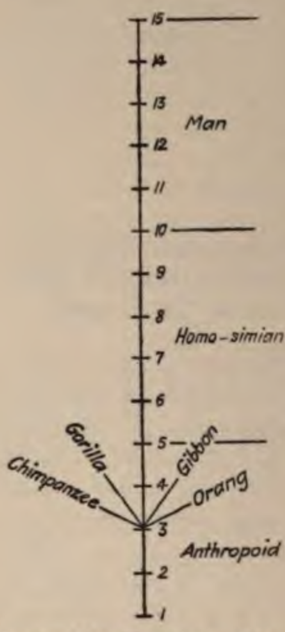

FIG. 1.—THE EVOLUTION LADDER, SHOWING MAN'S ASCENT FROM THE APE.

The third rung, 3, represents the position of man's primitive anthropoid precursor, with a cranial capacity of 300 c.c. The highest rung, 15, represents the position of modern civilized man with a cranial capacity of 1,500 c.c. The dignity of manhood was attained, it is assumed, at the tenth rung—*i.e.*, when the cranial capacity was 1,000 c.c. The anthropoid stage, or stage of the man-like apes, extended from the third to the fifth stage; the homo-simian stage, or stage of the ape-like man, from the fifth to the tenth stage; and the stage of man from the tenth stage onward.

Vegetable Food.—This consisted of—(*a*) Seeds, which, containing as they do an abundance of proteids, constituted the most important form of vegetable food. Some of these—*e.g.*, grass seeds—being very small, required to be collected in large quantities to afford an appreciable amount of nutriment; while others—*e.g.*, acorns, chestnuts, and the seeds of many pines, palms, and leguminous plants, as well as numerous varieties of "nuts"—individually yielded a goodly store. (*b*) Fruits: these included the luscious fruits, which were chiefly valuable on account of the sugars and salts they contained, and many species of berries. (*c*) The fleshy roots, a term which may conveniently be made to include any underground part of a plant (*e.g.*, tuber, rhizome, taproot) serving as a storehouse of nourishment, especially starch; (*d*) green vegetables, consisting of the leaves and young shoots of plants.

Lastly, among miscellaneous vegetable substances available as food for the evolving man in some localities were mushrooms, seaweed, the bark of certain trees, and gum.

These various vegetable foods differ, when uncultivated, from the corresponding cultivated varieties in containing more cellulose and in being less palatable, owing to the presence of bitter and acrid principles, the chief objects aimed at in their cultivation having been to diminish the cellulose and the unpalatable ingredients, and to increase the proportion of starch, sugar, proteids, and fats.

Another point regarding uncultivated vegetable foods on which it is here necessary to dwell is that they are by themselves totally inadequate to meet man's nutritive needs. One is apt to picture—and it would be interesting to know how far Milton is responsible for this—early man as surrounded by a profusion of sweet-tasting seeds and luscious fruits—as living in a very Eden of plenty, where abundance of delicate food was to be had for the mere trouble of gathering it. But the reality was far otherwise, as is sufficiently proved by the fact that even now, in spite of elaborate methods of preparing, and thus increasing the nutritive value of, the vegetable food, no existing race of man is capable of subsisting upon the products of the uncultivated vegetable kingdom alone. The popular belief to the contrary is perhaps in some measure due to the old mistaken notion that fruits like the fig, date, and banana grow, and always have grown, wild in perfection as well as in abundance, instead of being the finished products of a cultivation the origin of which is lost in an unfathomable past, and which has changed them out of all resemblance to their wild and barely edible congeners. The sugar-cane and the cocoanut have similarly been brought to their present state by centuries of careful cultivation; wild, they furnish but a meagre supply of nutriment.

THE DIET EPOCHS.

The dietetic career of the evolving man from homosimian times onwards has been characterized by three great advances, each of which has greatly augmented his supply of food.

The first advance was made—say at the tenth stage—(see Fig. 2) when the genuine hunting and fishing stage was entered upon — when man began, *i.e.*, to employ artificial aids in capturing his animal food, and thus came greatly to increase its supply, and to be correspondingly less dependent upon vegetable food. Until he had invented these he must have been unable, except by an occasional lucky chance, to procure any of the larger game, and only a very limited quantity of fish.

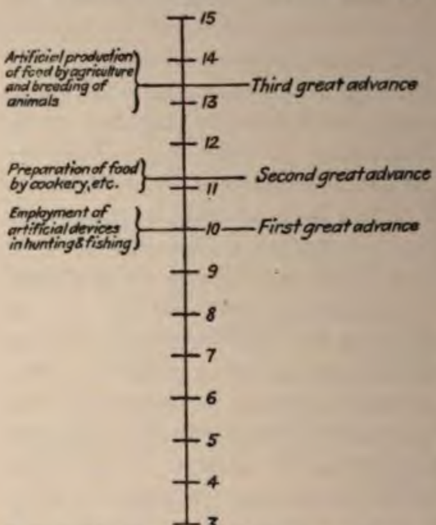

FIG. 2.—DIAGRAM INDICATING THE THREE GREAT DIETETIC ADVANCES MADE BY MAN IN THE COURSE OF HIS PHILOGENY.

The second advance came—say soon after the eleventh stage—when he began to subject his vegetable food to preparation, such as sun-drying, grinding, maceration, and finally cooking, which was probably not adopted until he

had already learnt to employ these three other methods. The employment of cookery, by converting the innutritious into the nutritious, led to a considerable increase in the supply of vegetable food, and opened the way to the cultivation of grain and roots which without cookery would have been comparatively useless.

The third great advance—preceded by the minor one which was made when he learnt to store his food, especially vegetable food, against seasons of dearth—occurred at about the thirteenth stage, when man began to cultivate plants and to breed animals for food. Once he had fairly entered on this stage he in one bound increased his food-supply a thousandfold, and became able to multiply and progress in a manner which had hitherto been quite impossible.

Let us now briefly consider the distinctive changes which this primitive diet has successively undergone from anthropoid times onwards.

The Anthropoid Period.—During this period the diet of our precursors was probably much the same as that of present-day anthropoids, consisting of seeds, fruits, leaves, young shoots of plants, and possibly also of roots; and of such animal food as insects, grubs, caterpillars, frogs, lizards, snakes, birds, birds' eggs, and the smaller mammals. Honey and gum were probably also consumed. It is to be noted that much of the vegetable food of this period was, by reason of the density and abundance of its cellulose constituents and its admixture with bitter ingredients, quite unsuited to the needs of the coming man.

The Homo-simian Period.—The next period, a very long one, saw the simian slowly struggle up from ape to man. He continued during most of it to subsist chiefly on raw vegetable food, but as his growing intelli-

gence and his increasingly nomadic habits enabled him to procure this in ever greater variety, the element of choice, of selection, had freer scope, and the more indigestible and unpalatable varieties were now rejected. Moreover, increased intelligence developing the means of procuring a greater abundance of animal food, the evolving man became more and more carnivorous, and though not yet able to capture any but the smaller and less fierce mammals, he ceased to depend so largely as he had hitherto done upon vegetable food, and this permitted him still further to discard the coarser and more acrid forms of it.

The Early Hunting and Fishing Period.—By this I mean the period when man first began to hunt and fish with method, and before he had learnt to cook his food. He could not become a skilled hunter without special weapons and devices, and these pre-suppose a considerable amount of intelligence. Without weapons or traps how was it possible for him to destroy the larger game, fiercer and stronger than himself? How, again, without special devices, could he secure any but small quantities of fish? While, therefore, his diet during the homo-simian period gradually became increasingly animalized with his general advance in intelligence, it was not until the hunting and fishing period was fairly reached that the evolving being, whom we may suppose to have attained by then to the dignity of manhood, became actually more carnivorous than vegetarian. The immediate effect upon his dietary of the systematic pursuit of hunting and fishing was the accession to it of a large amount of animal food, and this led to a further abandonment of the least attractive of the vegetable kinds, followed by a corresponding gradual loss in the power to digest them in the raw state. Another

effect was that man was now able to spread into regions which, without hunting, would not have provided him with sustenance. We may, in fact, date his gradual dispersion over the whole world from the beginning of the hunting period.

It should be observed that during all these three pre-cookery epochs, the whole of the vegetable food (save the luscious fruits, which contain their saccharides in a soluble form) needed very efficient mastication, in order to breakup their undigestible cellulose framework. This led to the thorough unsalivation of the starch, which was thus for the most part converted into dextrins and maltose within the mouth, very little passing into the stomach in the crude state. It will thus be seen that, prior to the discovery of cookery, the stomach of the evolving man had little acquaintance with undigested starch, such saccharide as entered it consisting chiefly of the soluble forms, like grape-sugar and fruit-sugar, together with a small quantity of cane-sugar (as in honey and the luscious fruits), or of the products of salivary digestion—*i.e.*, dextrins and maltose.

The Early Cookery Period.—This term covers the period when man, though he had learned to cook, had not yet attained to the cultivation of his vegetable food, nor to the breeding of animals to eat. Next to the invention of the axe cookery was the most epoch-making of all man's early inventions, paving the way, as it did, for the cultivation of roots and grain, and thus, ultimately, for the supremest achievements of civilization.

It is more especially on account of the effect of cooking on vegetable food that the discovery, or rather the invention, of the art marked an era in man's painful way upwards; and there can, I think, be no doubt that

it was for vegetable foods that the process was first employed, for cooking does not promote the digestibility of animal food: though it loosens the connective tissues, it coagulates the proteids. Why, then, should early man have been eager to cook the animals he killed? It is true that cooked food is more savoury than raw, but it is unlikely that he should have put himself to the trouble of cooking it merely for the sake of improving its flavour. He was a hunter and largely carnivorous during long ages before he learned to cook at all; and what he chased so eagerly we may be sure he devoured with no less eagerness, and with all the savage relish of the genuinely carnivorous animal. On the other hand, the digestibility of all vegetable food (the luscious fruits only excepted) is very greatly increased by cookery, and the importance of this discovery cannot well be over-estimated.

It is probable that before man cooked his vegetable food he had already begun to prepare it in other ways, as by sun-drying, grinding, and burying—by each of which processes its digestibility is materially enhanced—and by maceration, whereby poisonous and acrid ingredients can be got rid of. When he learnt to prepare it in these various ways, but especially when he began to cook it systematically, he greatly augmented his available supplies, for there are many vegetable substances which, in the unprepared state, either on account of the large amount of dense cellulose they contain, or from the presence in them of noxious substances, are of little or no value as food, but which, by cooking and other means, can be converted into highly valuable nutriment. With the discovery of cookery, indeed, man secured the master-key to wellnigh limitless stores of food (especially of the starchy forms of it) hitherto beyond his reach. Hence, with the progress of cookery —and it is surprising to what refinement the art had

attained before man began to cultivate the soil—the supply of vegetable food steadily increased, and the hunter was to some extent released from the chase and set free to devote himself to other pursuits. This increase continued throughout the period under consideration, until vegetable food came to constitute one-half or more of the total dietary.

Inasmuch as cooking breaks up the cellulose framework of vegetable food, man, when he began to cook it, was not compelled to masticate it to the same extent as before, with the consequence that the starchy ingredients came to be much less insalivated; and since with the advent of cookery more starch was consumed than previously, it is clear that considerably more entered the stomach in a crude state than had hitherto been the case.

That abandonment of the less digestible and less palatable kinds of vegetable food and the coincident loss of power to digest them in the raw state, which characterize the homo-simian and early hunting periods, are yet more marked features of the period in which man began to subject his food to artficial preparation, and as a result he came to depend less and less upon raw vegetable food and finally to restrict himself to the easily digestible kinds.

The Cibicultural Period.—This, the period of food-culture, began, let us say, some 40,000 years ago. Whether man first cultivated plants or bred animals, it is not easy to determine. In America and the islands of the Pacific it is certain that he first cultivated the former, and presumably he followed the same order in other parts of the world.

One of the first advances in the direction of vegetable food-culture was the learning to store supplies to provide against seasons of dearth, and a second was the discovery of means to protect and preserve food-plants. Both of

these agricultural foreshadowings are to be observed at the present day among the aboriginal pre-agriculturists of Australia. Similarly, man had learnt to preserve and store animal food—*e.g.*, by drying and smoking—long before he began to breed animals.

By the adoption of food-culture man once more enormously increased his supplies of nutriment. Instead of having to search laboriously for fruits, roots, and seeds, he took to growing them ready to hand. He cultivated groves of fig-trees, and of cocoanut and date palms, improving their fruits out of all recognition; he planted large fields of roots, such as the manioc, potato, and yam, and greatly increased their nutritive value; and instead of depending for his cereals upon the small seeds of wild grasses collected with infinite labour, he diligently tended and promoted their growth until he had developed the noble maize and the still more noble wheat, of which he has eventually come to grow millions of acres. And in regard to the animal kingdom, not only did he learn, in course of time, to increase his supply of fish by building fleets of fishing-vessels to reap the inexhaustible harvest of the sea, but also, in place of spending long hours in the hunt, which at best could yield but a very limited and precarious supply of animal food, he learnt to raise on his own account vast flocks and herds of oxen, sheep, goats, and pigs, and to breed birds of many varieties. Yet, inasmuch as the supply of vegetable food has been increased still more than that of animal food, the total effect of food-culture has been to make man more vegetarian than carnivorous, and hence, at the present day, his dietary tends to revert in principle, though happily not in details, to that of his anthropoid precursor.

So far as agriculture is concerned, the period under consideration falls into two sub-periods—(1) the period of

migratory agriculture, in which limited patches of virgin soil were planted and, the harvest reaped, abandoned for new ones; and (2) the period of stationary agriculture (*i.e.*, the present period) in which the ground is carefully kept productive—broken up, tilled, manured, rolled, and irrigated. During the former, especially in its earlier part, man still remained a hunter, combining hunting and fishing with desultory agriculture.

It is important to distinguish between these two sub-periods, for it is evident that, so long as the human community was nomadic and occupied almost entirely in the food-quest, substantial progress in culture was impossible. It was only when agriculture had become stationary, say some 30,000 years ago, and an abundance of highly nutritious vegetable food, and in some cases artificially reared animal food also, had been secured by the labour of a limited section of the community—it was only when in this way a large amount of the total energy of the community was liberated and made available for other purposes than the food-quest, that a complex division of labour became possible. Then it was that civilization began in real earnest, and that the splendours of ancient Babylon, Egypt, Mexico, and Peru rose in the midst of a barbaric world.

During the long period of agricultural development uncultivated vegetable foods have been gradually falling out of use, and the power of digesting raw vegetable foods, which had been steadily waning during the previous diet epochs, has still further declined. Even cultivated vegetable foods are, with the exception of the fruits, seldom eaten in the raw state now.

Another effect of agriculture has been to augment the supply of starch food to a prodigious extent. Within recent times, moreover, it has been the fashion among many

communities to consume most of the starch in a soft, pappy, or pultaceous form, such as refined bread, porridge, puddings, boiled potatoes, which are all too readily swallowed, and thus escape adequate salivary digestion; so that, in striking contrast with what happened in the case of early man, the modern stomach is literally deluged with crude starch.

Agriculture has further greatly increased the supply of sugar, which in pre-agricultural times was limited to that contained in honey and to the sugars of the luscious fruits. With the advent of the agricultural period and the cultivation of the date, the fig, the banana, and, in later times, the sugar-cane and the beetroot (from both of which cane-sugar is extracted in immense quantities), the supply of soluble saccharide has reached enormous proportions.

THE RELATIVE QUANTITIES OF ANIMAL AND VEGETABLE FOOD CONSUMED DURING THE SUCCESSIVE DIET EPOCHS.

We may now fittingly consider the fluctuations in the relative quantities of animal and vegetable food which have occurred in the diet of evolving man at the various epochs. As our anthropoid and homo-simian precursors grew in intelligence they were naturally able to secure more and more of the highly concentrated, and therefore much-coveted, animal food, such as insects, grubs, reptiles, eggs, birds, and the smaller game, and there took place in consequence, we may safely assume, a steady rise in carnivorism during the anthropoid and homo-simian stages, but especially during the latter. Nevertheless, we may regard it as certain that until the hunting and fishing period was reached our ancestors still remained essentially vegetarian. With the coming in of this era,

however, a change began to take place: their carnivorism now rapidly increased, so that in course of time they actually became more carnivorous than vegetarian. I say "more carnivorous than vegetarian," because even during the next diet period, when by means of cookery man had greatly augmented his supplies of easily digestible vegetable food, he was still obliged to depend very largely upon animal food, being then about half carnivorous and half vegetarian, as is proved by the dietetic customs of existing pre-cibiculturists. It is true that many of these peoples inhabit barren regions affording but meagre supplies of vegetable food, but it may confidently be affirmed that not the most luxuriant and bountiful region in the world is capable of supporting by means of its uncultivated flora alone any existing pre-cibicultural people, even with the great help to be got from their elaborate systems of preparing vegetable food. How much less capable, therefore, must it have been in pre-coctural ages!

But though it is certain that animal food formed a large proportion of the dietary of our pre-coctural ancestors, there can be no doubt that they were not so incapable as is civilized man of subsisting wholly on raw natural vegetable products, for there can be no doubt that the evolving man during the homo-simian and early hunting periods gradually lost much of his power to digest these.

Just as the introduction of cookery led to an increase in the quantity of vegetable food consumed, so also did the introduction of agriculture, and in an even greater degree; for while the breeding of animals augmented the available quantity of animal food, it did not augment it to anything like the same extent that agriculture augmented that of vegetable food. Certain communities, or sections of communities, do, indeed, at the present time subsist

chiefly on animal food; but taking agricultural communities at large, they are in the main vegetarian, and some, like the Hindus, almost entirely so.

To sum up, then. Our ancestors, though remaining chiefly vegetarian, slowly increased in carnivorism during the anthropoid and homo-simian stages, became more carnivorous than vegetarian during the early hunting period, half carnivorous and half vegetarian during the early cooking period, and thenceforward reverted more and more to vegetarianism. (See Fig. 3.)

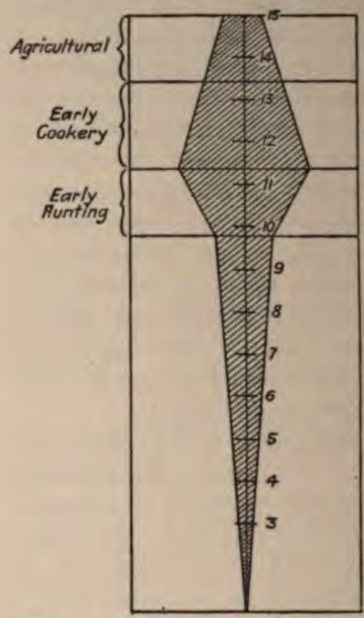

FIG. 3.—DIAGRAM SHOWING THE RELATIVE QUANTITY OF ANIMAL AND VEGETABLE FOOD CONSUMED DURING THE VARIOUS PHASES OF MAN'S EVOLUTION.

The unshaded area indicates quantity of vegetable food; the shaded area that of animal food.

As to the truth of these generalizations there can, I think, be no doubt. That man and his precursors have for hundreds of thousands of years been largely carnivorous; that the emerging man actually subsisted more upon animal than upon vegetable food; that, in fact, after evolving from his homo-simian precursors, man has mounted up all but the last one or two rungs of his evolutionary ladder on a highly animalized diet is as certain as anything well can be. This cardinal fact

must ever be borne in mind by those who seek to devise a rational system of human diet. To assume that disease and premature death necessarily result from animal food, and that in matters dietetic physiological salvation is to be found in vegetarianism alone, is to ignore the fact that for an extremely long period (10th to 11·5th grade) of man's philogeny he was actually more carnivorous than vegetarian. I am not forgetting that he was most carnivorous when in the hunting stage—when, namely, he was leading a highly active outdoor life; that during the agricultural period his organism became, and is still becoming, more and more adapted to a cooked vegetable diet; that a large quantity of animal food often proves injurious to the modern man when leading a sedentary life; and that even the carnivorous dog, when compelled to spend most of its life lolling about the house or chained up in a back-yard, is unable to tolerate a purely animal diet. All this is very true, but because a mainly animal diet is apt to be hurtful to those of sedentary habits, we must not on that account, and in the face of his past history, assume that the only diet suitable for man is the purely vegetable.

INFLUENCE ON THE DIGESTIVE FUNCTION OF THE CHANGES IN THE DIET OF THE EVOLVING MAN.

It is only reasonable to assume that the ability to digest animal food rose and fell with the quantity consumed during the various diet epochs, and that it was thus greatest during the hunting stage; and we may further assume that the ability to digest coarse and acrid vegetable foods in the raw state has steadily declined since anthropoid times. For, as we have seen, during the homo-simian and hunting periods, but especially the latter, the evolving man became less and less dependent upon vegetable food, and there was in consequence a

progressive abandonment of the more dense, bulky, and unpalatable kinds in favour of their opposites; and thus it came about that by the beginning of the coctural period man had, by discarding them, lost the power of digesting in the raw state many of the coarser and more unpalatable varieties on which his anthropoid ancestors subsisted.

With the advent of cookery and the greater quantity of easily digestible vegetable food which it rendered available, man became still less dependent upon raw uncultivated vegetable products, and this led to a further abandonment of, and loss of power to digest, them. Finally, agriculture has made him altogether independent of raw uncultivated vegetable food by placing at his disposal an abundance of palatable, easily digestible, and highly nutritious varieties of it, and hence the power, already much curtailed, of digesting in the raw state all but the choicest of the uncultivated varieties has been largely lost.

Up to the beginning of cookery, oral digestion was much more active than it has been since, owing to the prolonged trituration to which it was necessary before that time to subject most raw vegetable foods. It is probable, therefore, that the amyolytic power of the salivary glands was greater in pre-coctural times than it has since become, especially in these days of pap, when the starchy foods slip down into the stomach with a facility which can only be characterized as disastrous.

Inasmuch as until the early cookery period most of the saccharides were swallowed in the soluble form—*i.e.*, as grape-sugar, fruit-sugar, cane-sugar, maltose, or dextrin—we may assume that up to this time the stomach and intestines were intolerant of large quantities of starch, but that after the introduction of cookery their

ability to cope with this substance steadily increased, becoming ultimately greatest in those communities which, like the Hindus, are essentially vegetarian. In like manner we may surmise that the capacity to digest cane-sugar has been increasing.

The functional adaptations just referred to have not only been individual but racial, becoming the latter through the operation of natural selection—*i.e.*, by the survival of those best able to adapt themselves to the dietetic changes. We see this racial adaptation going on under our very eyes. Tens of thousands of bottle-fed and starch-deluged children are in our own country yearly weeded out, only those best adapted to these modes of feeding surviving and transmitting their digestive peculiarities to their offspring. Thus a race is evolving which is capable of being reared on cow's milk, and of digesting enormous quantities of starch and sugar.

But while, doubtless, man's digestive capacities have, during his evolution from the anthropoid stage, undergone definite modification, the change is probably less than might have been expected. It consists, for the most part, in a diminished capacity to cope with the coarser forms of raw vegetable food, a change which is paralleled in the anatomical sphere by a diminution in the size of the jaws and the teeth and in the muscularity of the stomach.* One other important fact stands out prominently—this, viz., that the digestive system of the evolving man has been characterized by an extraordinary capacity to cope with different kinds of food, and it is in no small degree owing to this that he has

* There is a great similarity between the digestive organs of the anthropoids and of man, the main differences being the greater muscularity of the stomach and the less complete development of the valvulæ conniventes in the anthropoids.

been able to spread over the world and successfully to compete with other animals. That this capacity is to some extent shared by existing anthropoids is shown by the readiness with which they take to a "human" diet. Thus, a chimpanzee, fresh from its native forest, will often greedily eat the ordinary cooked foods of civilized man, digesting quantities of cooked starch apparently without any difficulty.

This ability of the human digestive apparatus to adapt itself to many different kinds of dietary must be borne in mind. A common error is to regard it as stereotyped, and to assume that there is a fixed ideal dietary suitable for every one, any deviation from which is abnormal and wrong; whereas, the real truth is that any kind of dietary that the human digestive system can cope with is correct, and of such there are many—as many, indeed, as there are varying conditions of human existence.

CHAPTER XXX

MASTICATION

I PROPOSE now to consider certain points connected with the physiology of mastication, and some of the many evils that result from the imperfect performance of that function.

Mastication, by breaking up the Food, enables it to be the more easily swallowed.—Soft, moist, pultaceous foods, such as milk-puddings and porridge, can be—often indeed, are—swallowed without any mastication at all. On the other hand, it is difficult, if not impossible, to swallow large lumps of tough, or large masses of very dry, food, even though the latter is in a finely divided state, like flour. The tough food needs first to be broken up by the teeth, and the dry food to be moistened by the saliva. If, then, we desire to give foods which compel mastication, we should choose such as are tough and dry.

Those who are accustomed to bolt their food often swallow large lumps totally unmasticated, but (as Van Someren has pointed out), once the habit of efficient mastication has been acquired, the swallowing of such masses is effectually prevented by a pharyngeal reflex. It is therefore of the utmost importance that children should learn to masticate thoroughly as soon as they

have the teeth to do it. The instinct once developed tends to persist through life.

Mastication, by comminuting the Food, brings it into Intimate Contact with the Digestive Juices.—We have seen that all raw vegetable food, the luscious fruits excepted, requires mastication in order to disintegrate the cellulose and allow the digestive juices to act upon the imprisoned nutriment, but that this is not necessary in the case of cooked vegetable foods. Some of these, however, do, on account of their density, call for thorough chewing, as, for example, stodgy puddings and new potatoes; also new bread, which, unlike the more crumbly stale bread, is apt to elude the teeth and pass into the stomach in the form of solid, impermeable masses. Similarly, it is because cauliflower and minced spinach are more finely divided than new potato and cabbage that they are more digestible. If, now, we turn to animal food, we notice that while in the raw state it is readily digestible after little or no previous mastication, it may be rendered indigestible by being cooked, as in the familiar case of a hard-boiled egg or overdone meat; and putting these facts together, the deduction is that the relative digestibility of animal and of vegetable foods alike depends more upon physical consistence than upon chemical composition. Thus it is chiefly on account of their *density* that veal, pork, lobster, and cheese are indigestible. As regards the latter, it should be noted that casein in the form of plasmon and protein is quite digestible, and butter is recognized as one of the most digestible of fats, so that chemically there is nothing in cheese to prevent digestion; but since its two chief constituents are welded together in an impermeable mass, it may, if unmasticated, remain undigested for the physical reason. A plain, wholesome cheese, well masticated or intimately

mixed with other foods—*e.g.*, with macaroni—most people can digest without difficulty.

I do not, of course, deny the influence of the chemical factor. Such substances as goose-fat may set up violent irritation; pigeon taken several days in succession is apt to disagree; some there are, again, who cannot tolerate eggs in any form, and numerous other dietetic idiosyncrasies are met with; but making due allowance for any chemical influence, there can, I think, be little doubt that the digestibility of the more common articles of diet, whether animal or vegetable, depends in the main upon their physical constitution—that, in fact, *they all tend to be equally digestible if reduced to the same degree of comminution.* This, if true, is, I need scarcely say, a fact of the greatest importance, for it amounts to this: that we may often allow to those with very weak digestions foods generally debarred as indigestible, provided only that they are thoroughly comminuted, either by mastication or by other means.

Mastication promotes the Flow of the Saliva and the Insalivation of the Food.—The more the food is masticated, the more completely is it insalivated. Now, inasmuch as starch is converted by the saliva, first into dextrins and then into maltose, it follows that the whole of the starch of the food ingested may be transformed into maltose within the mouth if only mastication is persisted in long enough; and it is surely better for the individual to manufacture his maltose within the laboratory of his own organism than to have it administered to him in the form of the artificially prepared "malt extracts"; yet, strange to say, patients are often allowed these extracts when they are forbidden the starchy foods which they could, by adequate mastication, quite easily convert into maltose for themselves. As a matter of fact,

starchy foods, if sufficiently insalivated, are seldom indigestible.

Mastication increases the amount of alkaline saliva passing into the stomach, and thus not only prolongs the period of starch digestion in that organ, but influences gastric digestion in other ways; it is probable that a deficiency of alkaline saliva in the stomach is inimical to normal digestion.

Mastication promotes the flow of gastric juice, and thus prepares the stomach for the reception of food. This effect is probably produced chiefly through the medium of psychic influence, for the more efficiently mastication is performed the more effectually is the sense of taste excited.

Mastication stimulates the heart, and so promotes the circulation. Hence the chewing of such a substance as gum is stimulating, and doubtless the stimulating effects of betel- and tobacco-chewing are, partly at least, to be explained in this way.

INFLUENCE OF MASTICATION ON THE JAW AND ADJACENT STRUCTURES.

Muscles of Mastication.—Seeing that all rhythmic muscular contractions stimulate the flow of blood and lymph not only in the contracting muscles themselves but in the neighbouring parts also, it follows that the exercise of the masticatory muscles, which are far more massive than is generally realized, influences, with their own nutrition, that of the important structures adjacent to them—*i.e.*, the jaw-bones, salivary glands, buccal mucous membrane, soft palate, faucial tonsils, pharynx, naso-pharynx, and the nasal cavities with their accessory sinuses. All these parts are, during mastication, copiously flushed with blood and lymph, their nutrition being

correspondingly stimulated, and it is not therefore surprising that in those who from childhood upwards have been accustomed to masticate efficiently they should be well developed—the jaws well grown and shapely, the teeth sound and regular, the tongue (for we must not forget that it, too, is a masticatory muscle) and salivary glands large, the nasal and naso-pharyngeal passages spacious, and the mucous membrane of the buccal and adjoining cavities healthy; and that, on the other hand, in those who have never adequately exercised their masticatory muscles these various structures should be correspondingly ill-developed and liable to disease. It should be observed that the pterygoid muscles, springing as they do from the internal pterygoid plates, are in close relation with the naso-pharynx, a fact which, if I mistake not, is not without significance in connexion with the etiology of adenoids.

The Jaw-bones.—That the jaws do not attain normal size unless properly exercised is shown by the overcrowded teeth of those brought up on soft foods, even in the absence of that peculiar deformity of the jaws resulting from mouth-breathing, which, as we shall see, is itself the indirect result of inefficient mastication.

The Teeth.—But were there any doubt on these matters, it is only necessary to consider the teeth themselves to arrive at certainty. Who can contemplate the jaw-bones of a six-year-old child, so dissected as to display all the embedded teeth, without being assured of the influence of mastication in promoting their normal development and eruption? Fifty-two teeth meet the view; the entire region from the orbital rims to the inferior border of the mandible is, in fact, a mosaic of them, temporary and permanent, the latter in various phases of growth, and only by efficient mastication that

shall ensure the conditions necessary to it can t
adequate development possibly be brought about. I
mastication alone that can stimulate the circulation-
the tooth-germs that they may grow, and in the j
that, when grown, the teeth shall find room; and ma
cation, again, is necessary to enable the permanent te
to take up their normal positions on the alveolar ridges
as to secure a good "bite"—*i.e.*, proper apposition of
upper and the lower teeth. The pressure of the two r
of teeth against each other makes for a healthy condit
alike of the teeth, the alveoli containing them, and
surrounding tissues of the gums, inasmuch as it cau
the teeth to "wobble" in their sockets, and thus stir
lates the circulation in tooth-pulp, periodontal me
brane, and adjacent parts. Hence disease of the te
and periodontal membrane (*e.g.*, caries and pyorrh
alveolaris) is much more common in inefficient than
efficient masticators.

A few words may here be said regarding the influe
of mastication in wearing down the teeth. Those w
masticate well wear away their teeth considerab
This is due not so much to the attrition of coarse h
food against the teeth as to that of the opposing te
against one another, for it must be remembered that
normal mastication these are not merely pressed ve
cally one upon another, but also are made to rub agai
one another by a lateral and sagittal movement. If
a person, say over thirty, we find little or no weari
down of the teeth, we may be sure that he does
masticate properly; the information which this sim
test gives may often cause us to surprise our patie
by passing an accurate opinion on their masticat
habits. I suppose it is because the English peop
nurtured principally on soft food, do not wear their tee

down, and still more because, not using their teeth properly, these tend to grow out of their sockets and thus appear unduly long, that our Continental neighbours regard us as being large and long in the tooth, and as such so frequently represent John Bull in their cartoons.

Philogenetic Changes in the Maxillary Apparatus.—Inasmuch as before man learnt to break up the cellulose framework of his vegetable food by cooking, grinding, and other means, he was compelled to make vigorous use of his masticatory apparatus, we may be sure that in the pre-cookery period this was correspondingly strong and massive; but when with the discovery of artificial means of disintegrating the cellulose (grinding and cooking) mastication was in great measure relieved of one of its chief functions, the jaws and teeth began to get smaller, while dental caries, hitherto almost unknown, became less rare, invading chiefly the third molars (" wisdom teeth "). Again, as the effect of agriculture was to reduce the cellulose ingredients of vegetable food and thus to render it more easy of mastication, we find the jaws and teeth further diminishing in size during this next period, and diseases of the teeth increasing in frequency. These effects were not, however, pronounced during the early agricultural epoch, partly because man still continued to eat freely of raw vegetable food, and partly also because much of his cooked vegetable food needed, owing to its coarseness, considerable mastication. It is not until we arrive at the neo-agricultural stage that the effect upon the jaws and teeth of food artificially produced and prepared becomes pronounced. The present-day vegetable food —in our own country, at least—owing to the combined effects of improved agriculture and skilful milling and

cooking, is so soft that it excites comparatively little mastication. We live, in fact, in an age of pap. Hence the modern jaw is undergoing considerable diminution in size, with the result that the teeth, which are not diminishing in number at the same rate, are often unable to take up their normal positions, while dental diseases have assumed truly alarming proportions.

THE INSTINCT TO MASTICATE.

During the first months of life the natural function of feeding at the breast provides the infant's jaws, tongue, and lips with all the needful exercise. This bottle-feeding fails to do, and in consequence we frequently find bottle-fed children seeking to satisfy their natural instinct to use those structures by sucking their fingers or other convenient objects. The teeth are a provision for biting hard foods, but even before they actually appear the child tries to exercise his toothless gums on any hard substance upon which he can lay hold, and there can be no doubt that his so doing tends to facilitate the eruption of the teeth, a truth which is, indeed, universally recognized, whether by the primitive mother who hangs the tooth of some wild beast round the neck of her infant, or the up-to-date one, who provides hers with a bejewelled ivory or coral bauble. As soon as the teeth have been cut, the masticatory instinct has among primitive peoples abundant scope in the chewing of the coarse, hard foods which constitute their dietary; but in us moderns, subsisting as we do mainly on soft foods, it does not find its proper expression, and thus it tends to die out. Nevertheless, it dies a hard death and long continues to assert itself; witness the tendency of children to bite their pencils and penholders and to chew small pieces of india-

rubber for hours together. I have known a child to gnaw through a bone penholder much in the same way as a carnivorous animal gnaws at a bone.

This instinct to chew for chewing's sake manifests itself all over the world, and it is not confined to children. The English child's habit of chewing indiarubber finds a parallel in the gum-chewing so much practised by Americans of all ages, and both are evidently survivals from far-off times. Gum-chewing has long been a practice of the Redskins, and the primitive Australians down to the present day chew gums of several kinds. The custom also of chewing such substances as betel—very common in the East—must be regarded as another instance of the assertion of the masticatory instinct. No doubt the attractiveness of betel depends in great measure upon its stimulating properties, but it must not be forgotten that the mere mechanical act of mastication stimulates the circulation, a fact which helps to explain the universal tendency of mankind to chew non-nutrient substances.

I may allude in passing to the grinding of the teeth which takes place during sleep in disturbed states of the nervous system. It is a true masticatory act, in which the normal lateral movement of the mandible is well marked, and it may thus be regarded as a perverted manifestation of the masticatory instinct.

THE CAUSATION OF DEFECTIVE MASTICATION.

We have now to inquire into the various causes of inefficient mastication.

Softness of Food.—By far the most important of these lies, as already indicated, in the nature of the food taken. The food of to-day is for the most part soft and

pappy, of a kind, that is, which does not compel thorough mastication. This feature is especially noticeable in the case of children's diet. At the seventh or eighth month all kinds of artificial saccharide foods, in liquid or semi-liquid form, are poured into the child's stomach; later he is fed on such viands as mashed potatoes and gravy, rusks soaked in milk, milk-puddings, bread dipped in bacon-fat, pounded mutton, thin bread-and-butter, and the like; and we are glibly told that this is the kind of diet best suited to the young of man from the time of weaning to the end of the second year. The same pernicious methods are followed subsequently. "Perhaps the great majority of children, after they have got their complete set of temporary teeth, have," writes Dr. Sim Wallace, "a dietary such as the following—Breakfast: bread-and-milk or porridge, milk, tea, coffee, or cocoa, bread-and-butter, perhaps an egg. Dinner: potatoes, or gravy, or meat, milk-pudding. Tea: milk or tea, with bread-and-butter, jam, cakes. Supper: bread or biscuit and milk." Now, food of this kind does not invite mastication, and it in consequence finds its way all too readily into the stomach. Small wonder that the child nourished on such pappy food acquires the habit of bolting, and learns to reject hard, coarse foods in favour of the softer kinds. Everything nowadays must be tender, pultaceous, or "short." Given a choice between a food compelling little or no mastication and one necessitating prolonged mastication—as between, say, fresh Vienna bread and an Abernethy biscuit—and in nineteen cases out of twenty the one which gives the least trouble in eating will be chosen. To such absurd lengths is this harmful predilection carried that even bread-crust is avoided by many; witness the fashion of eating bread-and-butter with a minimum of crust. And when we trace

the diet of the modern from childhood upwards it is the same story: the food tends to remain soft and pappy to the end.

Animal food, especially as it comes to the tables of the well-to-do, necessitates very little mastication, and the coarser varieties of vegetable food, which alone call out the full functional activity of the masticatory apparatus, are absent altogether. The vegetable food of to-day—cooked potatoes, greens, peas, beans, and the like—can be, and generally is, swallowed without any mastication worthy the name; and our flour is so carefully deprived of its fibrous portions before being worked up into bread, cakes, and pastry that shall eat light and short, that these articles also give very little opportunity for chewing; while such products as rice, vermicelli, tapioca, and macaroni are, as served at table, so soft that they slip down into the stomach almost as readily as water.

Let anyone run through his daily dietary, and he will realize how very little work his masticatory apparatus is called upon to perform. It will read something like the following—Breakfast: porridge and milk, eggs, bacon, bread, and marmalade. Lunch: fish, tender meat, boiled vegetables, some "sweet," and cheese. Tea: bread, butter, cake. Dinner: much the same as lunch. What opportunity, I would ask, does such a bill of fare afford for the adequate exercise of the jaws and teeth, and for the proper functional activity of the salivary glands?

Defective Masticatory Apparatus.—Another frequent cause of imperfect mastication is some defect in the masticatory apparatus, and defects of this kind are, as already pointed out, very common in those who have not been accustomed to masticate properly in early life. Foremost among these are irregularities of the teeth,

leading to faulty "bite" and caries of the teeth, the latter not only causing them to be tender, but to break off, if it does not lead to their actual extraction. Mastication cannot be properly effected when the bite is defective, for in this case there is imperfect apposition of the upper and the lower teeth, and the latter are, moreover, incapable of that ample lateral movement which is essential to normal mastication.

Personal Idiosyncrasy.—Some are temperamentally more disposed to hurry over their meals than others. The katabolic, restless, nervous person is much more apt to swallow his food hastily than is his deliberate and lymphatic brother. Individual differences in this respect are even observed among the lower animals. Thus, one of a pair of horses of about the same age and build is nervous and excitable and inclined to bolt his food, while his companion of more stolid temperament is a thorough and efficient masticator. The former shows comparatively little wearing down of the teeth, and often suffers from indigestion, a large proportion of corn-grains passing through his digestive canal intact; in the latter the teeth are well worn, indigestion never occurs, and but very few grains are passed unchanged.

It may be objected here that we cannot help temperament, and to a large extent this is true; but much may be done towards modifying it, and it is something to know where dangers, temperamental or other, lie.

Circumstances of Life.—Lastly, in this hurrying age people (of what temperaments soever) are not sufficiently deliberate over their meals. The city man rushes through his breakfast to be in time for his train, and as likely as not hastily swallows his lunch in his office or at a bar; tradesmen are apt to take their meals in snatches, and they frequently allow their assistants very

insufficient time for theirs; and the busy professional man is often obliged to take a hurried snack in the short intervals between seeing his clients. Under these circumstances there is small cause for wonder that the habit of bolting is acquired. A meal should be regarded as an end, and an important end, in itself. It should be taken at leisure, body and mind being for the time given up to it and to agreeable social intercourse.

CHAPTER XXXI

EVILS RESULTING FROM INEFFICIENT MASTICATION

The good effects upon the organism of efficient mastication being profound and far-reaching, it follows that inefficient mastication must lead to many evils. What these are we have now to consider.

Too much Food is Eaten.—Inefficient mastication conduces to excessive eating. It is obvious that soft foods, which pass so readily into the stomach, predispose to it, and hence a danger at all periods of life, not only in grown-ups but in children, even infants. Brought up as the latter are mainly on liquid and pappy foods, they are apt to consume far more than is needful, and also far more than is healthful, their stomachs being literally deluged with nutriment. But when the food is of a kind necessitating thorough mastication it is much less likely to be taken in excess, for the longer the time spent in mastication the less the temptation to go on eating. Even in the case of soft food less will probably be eaten if it is thoroughly masticated and insalivated than if it is bolted. Thorough mastication, however, not only tends to diminish the amount of food consumed on account of the time and labour it entails: it actually reduces—and this is very interesting—the amount needful to constitute

a sufficiency, for the more perfectly the food is chewed the more perfectly is it digested and the more economically is it disposed of in the system; the less, moreover, is the tendency to that morbid craving for food which is so frequent an accompaniment of defective digestion. It is certain that appetite and the needs of the system are sooner satisfied when food is well masticated and digested than when it is swallowed whole.

The last paragraph was written before I was aware of Mr. Horace Fletcher's having written on the advantages of efficient mastication. He has abundantly proved on his own person the truth of the *a priori* contentions just put forward. He finds that by subjecting every morsel of his food to prolonged mastication he is able to subsist on so small an amount as 10 ounces daily, and that since he has adopted this plan his health and vigour have improved extraordinarily. Most remarkable of all, he has shown that by this simple expedient of thorough mastication the fæces can be rendered deodorous, an indication that intestinal digestion has taken place with a minimum production of poisons. Under such circumstances we may be sure that the blood has a low toxic index, and this, it is needless to say, is highly conducive to health and the feeling of well-being.

Possible Death by Suffocation.—In the case of adults this is only likely to happen during intoxication, when a lump of unmasticated food may lodge in the throat. Children sometimes choke from eating too fast, but this, as we shall see, is unlikely to occur in those who have been fed on rational lines and in whom the normal masticatory instinct has been permitted to develop.

Masses of Imperfectly Masticated Food in the Stomach may cause Disturbance.—Lumps of such substances as hard-boiled eggs, lobster, cocoanut, mince-

pie, new bread, being little permeable to the gastric juice, may undergo abnormal chemical change in the stomach, and in this way cause violent local irritation, even to the extent of setting up acute gastritis; or, paralysing the gastric nerves, they may check gastric secretion and movement, and thus remain *in loco* wholly undigested for hours or even days. The passage of imperfectly digested food into the bowel may still further aggravate matters by causing intestinal disturbance. Thus the habit of bolting the food is now recognized as a potent cause of appendicitis; solid lumps of such articles as pineapple, preserved ginger, nuts, tough meat, and lobster, are apt to pass beyond the pylorus, and, escaping intestinal digestion, to lodge in the cæcum and precipitate an attack, the most common predisposing cause of which is a loaded cæcum, often preceded by constipation.

An Excess of Starch may Pass into the Stomach.—We have just seen that inefficient mastication tends to promote over-eating, and what has been said on this head applies to all kinds of food, the starchy among others. It leads, however, to a further evil as regards the latter—viz., to inadequate insalivation and digestion of it in the mouth, so that the stomach becomes flooded with crude starch. I cannot too frequently repeat that in ancient times, especially in the pre-cooking stage, laborious and sustained mastication was needed in the case of all starch foods, in order to liberate the starch and other nutritive ingredients from their undigestible cellulose envelopes, and (since raw starch is freely digested by the saliva) the process went far to effect at the same time complete digestion of the starch within the mouth; consequently very little passed, crude, into the stomach of primitive man. With us moderns the case is very different, and while from the point of view of digestion

mastication is as needful as ever—indeed, more needful, in view of the far larger quantities of starch we now consume—it is no longer necessary for the purpose of breaking up raw cellulose. By means of agriculture and cooking man has enormously multiplied his supplies of saccharide, and large quantities of starch are now consumed with little or no preliminary chewing, for when food can easily be swallowed without mastication, few will take the trouble to masticate it. In these circumstances the starch does not undergo adequate salivary digestion, and most of it passes wholly undigested into, and out of, the stomach, not beginning to be digested until it reaches the bowel. Small wonder that the latter should rebel against this invasion, and that flatulence, pain, and other dyspeptic evils should result.

It is especially in young children that these evils are observed. Too often the child—semi-carnivorous, remember, by its ancestry — is literally gorged with pure starch. At the seventh or eighth month, or even earlier, this substance—for many of the patent foods contain it—is poured into its stomach without undergoing any salivary digestion whatever, and a long time after infancy large quantities are given in the liquid or pultaceous form—*e.g.*, as rusks soaked in milk, puddings, and mashed potatoes. This practice of deluging the digestive organs with starch, besides leading to the more immediate troubles connected with flatulent dyspepsia, gives rise to the abundant formation of toxins, which, by irritating the alimentary mucous membrane, set up gastro-intestinal catarrh; this, again, intensifies the dyspepsia already existing, and causes a still further production of toxins, so that the motions become intensely fœtid. The poisons then being absorbed into the blood, the tissues become saturated with them, the nutrition of the

entire organism is disturbed, and the faulty metabolism manifests itself by a diminished resistance to pathogenic agencies, by a tendency on the part of the tissues to inflame (as shown by the liability of children thus fed to bronchitis, naso-pharyngitis, and tonsillitis), by their proneness to tuberculosis, and finally by a disposition to rickets, which one can hardly doubt is essentially of toxæmic origin.

It would appear, also, that an excess of starch in the stomach may set up hyperchlorhydria—*i.e.*, that form of dyspepsia in which there is excessive secretion of hydrochloric acid. W. Russell has shown that in this condition starch is the last constituent to leave the stomach; that when the stomach has so far emptied itself as to contain but one or two ounces of very acrid material, the residue consists chiefly of finely divided, undigested starch, which continues to stimulate the gastric secretion, "and there being no more proteid with which to combine, the secretion accumulates and leads to hyperacidity."

It will be gathered from the foregoing that the best way to secure efficient digestion of starch is by means of thorough mastication. This simple fact is most strangely overlooked, and we are constantly told that patients with weak digestions should be careful to avoid all starchy foods which have not been thoroughly cooked, as if cooking, instead of chewing, solved the difficulty. Thus Van Valzah considers that "not a little of the difficulty of the digestion of starches and cereals can be overcome by more thorough cooking," and he goes on to say that "patients who cannot eat potatoes after ordinary cooking are often able to digest them very readily if they are doubly cooked before being served. *Cereals, as a rule, should be allowed to simmer all night, and then be thoroughly cooked for a half-*

hour in the morning before being eaten."* This is an admirable illustration of the modern tendency to cheat the mouth of its proper work.

Deficiency of Alkali in the Stomach.—Efficient mastication leads to the passage of a large quantity of alkaline saliva into the stomach, where its presence promotes normal gastric digestion. In those who bolt their food, therefore, the stomach is defrauded of its proper supply, and this may lead to indigestion. It is not a little remarkable that alkalis have long enjoyed a great reputation in the treatment of this affection, but why administer the alkali as a medicine when the individual can himself provide his stomach with as much of it as it needs by means of his salivary glands? All that is requisite is to masticate efficiently, and such efficient mastication is, in my experience, the most effective way of treating hyperchlorhydria.

EVILS OF INEFFICIENT MASTICATION IN CONNEXION WITH THE JAWS AND ADJACENT STRUCTURES.

The Nasal Passages, Naso-pharynx, and Faucial Tonsils.—Pap-feeding promotes disease in these structures in several ways. Let us trace the long pathological chain link by link. In the first place, owing to defective use of the masticatory muscles, the nasal chambers and naso-pharynx fail to grow properly; in the next place, and for the same reason, the flow of blood and lymph in these parts is apt to be sluggish; finally, the excessive ingestion of saccharide food which pap-feeding entails is liable to set up protracted gastro-intestinal indigestion, and this begets toxæmia, which in its turn engenders the catarrhal diathesis.

* *British Medical Journal*, Epitome, 1903, vol. i., p. 45. The italics are mine.

In children thus fed we have, therefore, several conditions conducive to disease of the parts in question—defective development, sluggish circulation, and toxic saturation. Is it any wonder, then, that the modern child should so frequently suffer from rhinitis, naso-pharyngitis, tonsillitis, and from hypertrophy of the faucial tonsils and of the pharyngeal tonsil (adenoids)?

It is to pap-feeding that I attribute the frequency of adenoids among the children of civilized communities. I claim, in fact, that this disease is largely dietetic in origin. I submit that a child whose nasal apparatus and naso-pharynx are well-grown and habitually bathed in a stream of pure blood and lymph, this stream being periodically accelerated by an ample and vigorous use of the masticatory muscles, is unlikely to contract adenoids. On the other hand, I contend that a child in whom these parts are ill-developed, and at the same time bathed in an habitually sluggish stream of tainted blood and lymph—one, *i.e.*, that is not only poisoned but also rarely, if ever, hurried along its lazy course by due exercise of the muscles of mastication—I contend that such a child runs great risk of contracting the disease. The influence of toxic saturation (with its resulting catarrhal tendency) in setting up adenoids is shown by the frequency with which this affection follows upon the rhinitis and naso-pharyngitis of measles and diphtheria; and in order to realize how greatly the circulation in the naso-pharyngeal walls must be influenced by mastication, one has but to remember how closely the pterygoids are related to this region; in exploring it for adenoids they can, indeed, often be distinctly felt.

I think it also possible that, inasmuch as a lusty use of the voice aids the circulation in the naso-pharynx,

insufficient exercise of it may be a contributory factor in the causation of adenoids. It is natural for the young human being to scream and shout, and one may well doubt whether the modern town-bred child is afforded sufficient opportunity of venting his vocal energy in outdoor play.

This, then, is my explanation of the truly fearful prevalence of adenoids among the moderns: it is essentially a disease of pap-fed peoples. A child may, with the one exception that he is fed on a pappy, supersaccharide diet, be brought up under ideal health conditions: he may live in the heart of a dry, open country, far from the darkness, dust, and tainted atmosphere of any town, sleep with the windows open all night, live out of doors all day, be fed on the most nourishing food, clothed after the most approved methods, and yet, in spite of all this, we may find his naso-pharynx packed with adenoids. This disease is, in fact, scarcely less prevalent in the country than in the towns, scarcely less common among the rich than among the poor. Yet in primitive communities it is practically unknown! And what, I would ask, is the one condition in which the material environment of my supposititious child differs from that of the primitive child? What but the factor of diet? Therefore, I say, the prevalence of adenoids among moderns must be the result of the modern system of feeding children and of the defective mastication which goes along with it.

That the foregoing is a grave indictment against that system need scarcely be said; for adenoid disease is fraught with many evils, amongst others mental hebetude, deafness, indigestion (from the swallowing of unhealthy discharges), and, most serious of all, nasal obstruction and consequent mouth-breathing. This

leads to innumerable troubles, foremost among which are laryngitis, bronchitis, and defective development of the maxilla, or what may be styled the "mouth-breather's jaw," the chief characteristics of which are lateral compression of the maxilla and irregularity of the teeth. Indeed, pronounced dental irregularity practically always indicates the existence during developmental life of protracted nasal obstruction, and this in nine cases out of ten is due to adenoids.

The Tongue and Salivary Glands.—In inefficient masticators the tongue is generally small. It must not be forgotten that this organ is much more efficiently exercised at the breast than at the bottle. The breast-fed infant has to do some work for his meal by vigorously tugging at and squeezing the nipple with tongue and lips, while the bottle-fed child, unless the opening of the teat is made very small, can glut himself by doing little more than opening his mouth, and consequently the tongue does not develop so well as in the case of the breast-fed child. It might be thought a matter of indifference whether this organ develops to its normal proportions or remains small; but this is by no means the case, for, as Dr. D. Sim Wallace has shown, its pressure against the teeth promotes the normal development of the jaws, especially of the mandible.

Again, inefficient mastication during early life fails to call forth the normal functional activity of the salivary glands and to secure their adequate development, and the importance of the saliva in digestion has already been enlarged upon.

The Jaw-bones.—If the jaw-bones are not adequately exercised in youth, they fail to develop properly, and there is apt, in consequence, to be overcrowding of the teeth. It will thus be seen that defective

mastication leads to irregularity of the teeth in two ways: first, directly, and secondly, indirectly, through the induction of adenoids. Such irregularity not only predisposes to dental caries by favouring the lodgment of food between the teeth, but it also causes defective "bite," and when the bite is defective normal mastication is impossible, both because the teeth cannot be properly opposed, and because, owing to their interlocking, that free lateral movement of the mandible needful to normal mastication cannot take place. I do not say that defective bite is the sole cause of imperfect lateral movement; it is to be observed in most moderns brought up on soft, pappy food, whether the bite is good or not. Normal mastication is, in fact, becoming a lost instinct. The average modern masticates mainly by a vertical compression of the lower teeth against the upper, and in only a small degree by the lateral frictional movement which, needless to say, is the more effective method for grinding purposes, and it is, I doubt not, chiefly for this reason that the teeth of modern man are so much less worn down than those of primitive peoples.

The Teeth.—A train of evils follows from defective use of the teeth. When they are adequately exercised so that the circulation of blood and lymph in the tooth-pulp, the periodontal membrane, and the surrounding tissues of the gum is vigorously stimulated, and the cavity of the mouth copiously bathed in salivary and other buccal secretions, we have conditions which make alike for the health of the teeth, the periodontal membrane, and the alveolar walls, as well as of the mucous lining of the mouth. When, on the other hand, the circulation is not duly stimulated in this way, the teeth fail to develop properly, while the secretions of the mouth tend to be both scanty and unhealthy; both of

which conditions, but especially the latter, predisp
to caries.

Another result of imperfect use of the teeth is un
thinness of the alveolar walls, which, I suggest, is in p
responsible for the premature senile shedding of
teeth among moderns. We know that the teeth tenc
drop out in old people, owing to senile atrophy of
alveoli, and the process, one cannot doubt, must
hastened by insufficient exercise of the teeth. Her
while senile shedding of the teeth is common among
they are, so far as I am able to gather from an
amination of museum skulls, rarely shed among primit
peoples before extreme old age.

A still worse evil attaching to inefficient use of
teeth is pyorrhœa alveolaris. This disease is the ch
cause of the premature loosening and shedding of
teeth observed among moderns, and is, I cannot dou
itself largely the result of inefficient mastication.
consists of a purulent inflammation of the periodon
membrane, owing to its invasion by pyogenic coc
Now when, by vigorous mastication, the buccal cav
is kept well flushed with healthy secretions, the grow
of micro-organisms within the mouth is checked ; a
if by the same means the circulation of the periodont
membrane and adjacent tissues is also periodical
stimulated, these offer stout resistance to microb
invasion. On the other hand, when mastication
inadequate, the secretions of the mouth are defecti
both as to quality and quantity, and the growth
micro-organisms within the buccal cavity is favourec
while the circulation in the periodontal membrane ar
adjacent structures being at the same time inadequate
stimulated, the vitality of these tissues is feeble, and th
offer but slight resistance to parasitic attacks. We m

therefore, I think, safely infer that inefficient mastication is a potent cause of pyorrhœa alveolaris; and inasmuch as, going a step further back, soft food is the chief cause of inefficient mastication, we must regard the disease in question as one more evil for which pap-feeding is responsible.

Soft foods further predispose to it by their proneness to lodge between the teeth, where, undergoing decomposition, they afford a nidus for microbic activity. The condition of the teeth and gums among the civilized poor is, alas! calculated to make us seriously question the merits of our much-vaunted civilization. The putrescent breath, the spongy, pus-exuding gums, the lengthening, wabbling, tartar-covered, carious teeth (to say nothing of their unsightliness), constitute a sufficiently damning indictment against the pernicious modern plan of cheating the teeth of their proper work by living on a soft, pappy diet. I never examine a mouth of this kind without being impressed and oppressed by the fact.

Since the introduction of cookery there has been a progressive lessening in the work of the jaws and teeth, and, parallel with this, a diminution in their size and a steady increase in the prevalence of dental disorders. Among the anthropoid apes in their natural state such disorders are practically unknown, and I think we may conclude that this was the case with man also, before he learnt to cook. Among the pre-agricultural races the effect of cookery is shown in the diminution in the size of the wisdom teeth and in the length of the alveolar ridge posterior to them, as well as in the occasional occurrence of caries, especially of the wisdom teeth. In the early agricultural period, owing to the increasing softness of the vegetable food, jaws and teeth, especially the third

molars, show a tendency to be smaller than in the previous period, while caries and other dental disorders, though rare, are more common than in the pre-agricultural cookery period. In the late agricultural period, however, there is a great and disastrous change. Not only do we find a considerable diminution in the size of the jaws and the teeth, but the former are frequently misshapen and the latter terribly liable to disease.

I have now set forth some of the evils resulting from inefficient mastication. They are many and serious. The primary evils, such as over-eating, indigestion, adenoids, dental caries, and pyorrhœa alveolaris, are bad enough; but when we consider the secondary evils to which they give rise (and I have mentioned only a few of them), we cannot escape the conclusion that an appalling amount of misery and suffering may be traced to neglect of inculcating the habit of efficient mastication. How this end can best be accomplished will be considered in the next chapter.

CHAPTER XXXII

MEANS OF ENSURING EFFICIENT MASTICATION

In order to secure the full advantages accruing from the use of the jaws and their appendages, it is above all necessary for them to be adequately exercised during the period of development. If this is done, not only will the tendency to the evils just detailed be greatly diminished, but the masticatory instinct will establish itself as a permanent force, so that the individual will tend for the rest of his life to subject even soft foods to thorough mastication. The tongue, the lips, and the jaws of the newly born child find their natural exercise at the mother's breast, and we should therefore do our utmost to get the mother to suckle her child. If, unhappily, we fail in this, we must see that the teat of the feeding-bottle is so constructed as to compel the child to earn his meal by, at any rate, some exercise. Directly the disposition to bite hard things is manifested, the instinct, for instinct it is, should be gratified. We may observe a tendency in this direction as early as the third or fourth month, and it becomes more and more pronounced as the time for the eruption of the teeth approaches. It is now more than ever necessary to provide the child with hard substances on which to

exercise his jaws and gums. A great deal of the trouble of teething is due to the disregard, or the ignorance, of this fact. What, then, are we to employ for the purpose? Though ivory, coral, and the like hard, smooth substances may be useful in their way, it is far better to give the child something which is not only hard but also nutritious and pleasant to the taste—something which will at one and the same time exercise the maxillary apparatus, excite the gustatory organs, and provide a certain amount of nutriment. To this end we may, as the teething-time approaches, give a chop- or a chicken-bone from which most of the meat has been removed, and we may increase its attractiveness by powdering the bone with white sugar or salt. From such bones no small amount of nutriment can be extracted, and this of a kind most acceptable to the infant stomach, for we must not forget that the young human being is essentially carnivorous. Chicken- and chop-bones, yielding as they do to the pressure of the gums, are, moreover, just of the right consistence for the purpose in view.

By thus providing the maxillary apparatus with suitable exercise we shall do much to facilitate the eruption of the teeth and the growth of the jaws and their appendages (including the salivary glands), and so to prepare the mouth for the reception of vegetable food. This should, of course, not be given until the teeth appear, and it should be noted that the order in which these make their appearance gives some indication as to the time to administer vegetable food to the child.

The lower incisors are first erupted (seventh to eighth month); then follow the upper incisors (seventh to tenth month). These teeth enable the child to *bite*, but not, be it observed, to masticate, for which function the

molars are necessary. Now, the first molars do not with us appear until the twelfth to the fourteenth month, and it seems certain therefore that our primitive ancestors, unless they cut their molars earlier, could not have obtained starch in any quantity until they had reached this age. These considerations suggest the desirability of not giving more than the smallest quantity of starch before the twelfth month. I am ready to admit that the modern child may have—indeed, probably has—inherited greater powers of coping with that substance than his pre-cooking ancestors possessed; but, even so, we must be carefully on our guard not to overtax those powers.

Dr. Sim Wallace suggests that the eruption of the lower incisors first is for the purpose of enabling the infant to pierce the outer covering of fruits so as to allow him to extract their soluble contents by suction; and that accordingly, when these teeth are cut, the child should be encouraged to bite such things as apples, oranges, or sugar-cane. This latter is an especially useful article of diet for children, providing, as it does, soluble saccharide in a dilute form; and it is best that the child should receive his cane-sugar well diluted, for, as we have seen, prior to the advent of agriculture man's supply of pure sugar was limited to wild honey, which, as it consists almost entirely of mono-saccharide, is very easily disposed of by the stomach. Nowadays the less digestible di-saccharide cane-sugar is very largely consumed in the undiluted state, when it is apt to set up disturbance. When, however, it is obtained by chewing the sugar-cane, it is diluted both by the water in the cane and by the saliva, and I should like to see children obtain most of their cane-sugar in this way. In any case, we should

do well not to allow children to partake of more than moderate quantities of sugar. This much seems clearly indicated by a study of man's dietetic history.

Before the twelfth month we should be careful to give the child its limited supply of starch in a form compelling vigorous mastication. If given, as is the custom, in the liquid or pappy form, it will pass down as crude starch into the stomach, and will be likely to cause indigestion; but if we select a form which obliges the child to chew properly, not only will the jaws, the teeth, and the gums obtain the exercise for which they crave, and without which they cannot properly develop, but much of the starch will be converted in the mouth into maltose. Nothing can be more foolish than to upset the child's digestive system by deluging it with liquid starch, and then seek to make it well by ordering it (as is so frequently done) malt-extract, the very substance—*i.e.*, maltose—which the child can, and ought to, manufacture within the laboratory of his buccal cavity.

There is only one way to develop the masticatory instinct in a child, and that is to give him food which obliges him to masticate. It is mere waste of words to tell him to chew his food properly; and to blame him for gobbling it is as unjust as it is foolish. The blame, if any there be, attaches not to the child but to those who are responsible for his irrational dietary. Scarcely more efficacious than telling him to chew is the plan, recommended by some, of teaching him how to masticate by setting him to watch and imitate (*sic*) the masticatory movements of some one else. All that is needful is to give the child from an early period foods which compel mastication. Many doctors are under the mistaken impression that if the young child is given solid food he will be likely to choke, but of this there

is no danger if he is given hard things from the beginning. It is only when, by pap-feeding, his normal masticatory instinct has been kept in abeyance and the habit of bolting the food has been acquired, that any danger is to be apprehended on this score. Even then it is but remote, and can be readily overcome by judicious handling.

Starch, then, should be given to the child in a solid and somewhat tough form, such as bread-crust. Loaves should be shaped so as to give a maximum of crust, and should be baked hard. A well-baked crust, cut in a suitable form, and spread with butter, bacon-fat, or dripping, constitutes a very acceptable and wholesome morsel. The coarser kinds of biscuit may also be allowed.

When by such means as these the child's instinct to masticate has had proper opportunity to develop, we may allow a certain amount of soft starchy food, such as porridge, boiled potatoes, milk-pudding, and the like ; and these he will now be likely to subject to something like adequate mastication, which will tend to mitigate the evils associated with such food.

If the child is brought up in this way the teeth will be able to cope with nuts, such as filberts and Spanish nuts, without any danger of being damaged ; for if a squirrel or a monkey, weighing a few pounds, can crack them with impunity, why not the child ? The cracking should, however, be done by the molars, while such hard nuts as Brazils had best be left alone.

Though animal food does not need prolonged mastication, it is, when cooked, all the better for a certain amount of it, owing to the coagulation of the proteids ; and in order to ensure the efficient mastication of meat, fish, and poultry by children, Dr. Sim Wallace recom-

mends that these foods should be given in large pieces, cut thin. "Flat pieces, about 1 inch square, generally *necessitate* a certain amount of mastication. It is difficult to swallow large flat pieces of meat without mastication, but when finely minced, little or no mastication is called forth." The younger the child, the more underdone should the meat be.

EXAMINATION OF THE MOUTH AND ADJACENT PARTS.

In examining our patients not the least important item is a thorough inspection of the buccal cavity. Each individual tooth should be inspected in a good light for the presence of caries, and careful observation should be made of the "bite." It must not be forgotten that an unopposed molar is useless for mastication, and also that it is better to have no teeth at all than a few only; for in the former case the toothless gums are enabled to come into contact throughout their entire extent, and, becoming hardened, constitute quite efficient grinding agents. Next, the gums, the alveoli, and the roots of the teeth must be examined, especially for the presence of erosion, tartar, and pyorrhœa alveolaris.

A word as to how to keep the teeth and mouth clean. Probably the best way of cleansing them is by prolonged mastication, which induces a copious flow of saliva. A crust of bread, or an apple *well* chewed, is much better than the modern toothbrush for cleansing the teeth. This requires to be used with great caution, as it is liable to injure the edge of the gum and the necks of the teeth, and thus to set up the condition known as "erosion." If employed at all, a soft brush should be chosen, and it should always be drawn away from the gums, both on the inner and the outer aspect of the teeth,

towards the biting surface, as well as across the latter. Better than a toothbrush is a twig of wood, teased out at one end so as to form a sort of brush, by means of which the teeth can be burnished and the food dislodged from them. Antiseptic powders and washes should be scrupulously avoided, for it is neither desirable nor possible to render the buccal cavity aseptic. The time of all others for cleansing the teeth is just before going to bed.

The mouth should be rinsed out, as a matter of routine, after each meal and on rising, and care should be taken to do this before the early cup of tea, so that the stomach may not be contaminated by the buccal secretions which have accumulated during the night.

CHAPTER XXXIII

QUANTITY OF FOOD

THE question of the amount of food his patient shall consume is a highly important one for the physician. He may sometimes save a life by withholding food altogether for a time; very often merely curtailing the amount, as in an habitual over-eater, may do great good; in other cases, again, the opposite plan of gorging the patient may be beneficial.

CIRCUMSTANCES INFLUENCING THE AMOUNT OF FOOD REQUIRED.

The more rapid the katabolism the greater the amount of food needed. Now, the rate of katabolism varies with many circumstances, such as age, sex, idiosyncrasy, size, external temperature, and the amount of exercise taken. All of these, therefore, go to determine the necessary food allowance.

Age.—The period of growth is characterized by great katabolic activity, and a correspondingly large supply of food is demanded during it. For some unexplained reason the formation of new tissue necessitates very active katabolism. Clearly the quantity of food required to carry on the constructive process is greatly in excess of the amount which is converted into and retained as

new tissue, for consider how small is the daily increase in weight as compared with the amount of food taken: from birth to the age of twenty years that increase averages about one-third of an ounce—a quantity represented by a moderate mouthful. The abundance of food required by a rapidly growing animal is therefore to be explained by the activity of its katabolism, and not by the quantity of food actually laid down as new tissue.

The rate of katabolism, and with it the needful amount of food, remain much the same from the beginning of maturity until the age of forty or thereabouts, when they diminish in progressive ratio until the end of life. When extreme old age is reached katabolism has become so sluggish that a surprisingly small quantity of food suffices. That "old people bear abstinence well" is an observation as ancient as Hippocrates; to make the aphorism complete, however, it should be added that they "bear excessive eating ill." This is an important therapeutic truth.

Sex.—A man needs more food than a woman, not only on account of his larger stature, but because he is the more katabolic of the two; he "burns" the faster a fact which shows itself in his very blood (which contains a larger percentage of chromocytes than that of the woman), and also in his proportionately larger pulmonary capacity. The smaller respiratory need of the woman is further shown by the facility with which she can, without discomfort, restrict her breathing capacity by means of the corset.

Idiosyncrasy.—Some persons are so constituted as to require more food than others. This may in part be explained by differences in digestion; but it is, I doubt not, chiefly referable to differences in katabolic activity. Some burn off the absorbed food more rapidly than

others. Compare the thin, wiry, restless, energetic person with his fat, phlegmatic brother : the one no amount of gorging will fatten, and the other a starvation diet will scarcely make thin. In the one the metabolic clockwork is regulated to go fast, so to say, and in the other to go slow.

Size.—Obviously those of large stature need more food than those of small, though, per unit of body-weight, they require less, inasmuch as metabolic activity tends to vary inversely with body-weight, because the less the weight the greater proportionally is the loss of heat. Hence the mouse requires much more food in proportion to its weight than does the elephant.

External Temperature.—The colder the weather the greater is the loss of heat, and the more active therefore the katabolism in order to make good that loss, and the greater consequently the demand for food. Thus it is that the Esquimaux consume prodigious quantities of food, notably of fat. By means of clothing, man is able to lessen the loss of heat in cold weather, and the more effectually he does this the less food will he need. In warm weather, on the other hand, the rate of katabolism tends to slacken, owing to the smaller demand for the generation of heat.

Muscular Exercise. — Exercise of the muscular system profoundly influences katabolism. A person lying quiet in bed needs comparatively little food, but when his muscles are doing laborious work, as in the case of a soldier on a forced march, a large amount is required—so much, in fact, that it is difficult for those engaged in sustained heavy muscular work systematically to over-eat, as witness the rarity of obesity among such. The moral to be deduced from this is not only that those engaged in muscular work need their food

allowance to increase proportionately with the work done, but also that those who eat liberally should take abundant exercise in order effectually to katabolize the excess. The sedentary should be constantly on their guard against excesses at the table. On the other hand, the ill-effects of a sedentary life may be reduced to a minimum by a spare diet. We not infrequently read in the newspapers of some recluse who, after living for years in one room, finally dies at an advanced age; and in all such cases it will be found that the diet has been spare and the habits probably those of a miser. Those, and they are many, who are compelled to lead a sedentary life may take comfort from this fact. It is the high living with little exercise that does the harm, not so much the scanty exercise in itself, and it need scarcely be said that these remarks apply especially in middle and late life. Not only is youth the period *par excellence* of muscular activity, but at this time of life an excess of food is most easily dealt with; in middle and late life there is a growing tendency to inactivity, and a progressive incapacity on the part of the tissues to cope with a redundancy of food.

CLASSIFICATION OF DIETARIES AS SUFFICIENT, INSUFFICIENT, OR EXCESSIVE.

The quantity of food a person consumes may be sufficient, insufficient, or excessive.

A Sufficient Diet.—By a "sufficient" diet is meant one just enough to maintain the normal body-weight; a diet which falls short of this is "insufficient," and one which goes beyond it "excessive."

It has, then, to be decided what the normal weight is. We cannot determine this during the years of growth, seeing that it is then constantly changing.

Here, however, instinct usually affords a sufficiently safe guide as to the amount of food that should be taken, always provided—and the qualification is an important one—that it is of plain and wholesome quality. In the case of the adult there is no such difficulty in ascertaining the normal weight. It may be defined as *the minimum weight consistent with the best health of which the individual is capable.* In order to ascertain this, the physician, in the case of a stout person, curtails the diet and cautiously diminishes the weight, until he is satisfied that any further reduction would be harmful; while, on the other hand, in the case of an unduly thin person he increases the diet, and thus the weight, until he believes the highest level of health to be reached. Some care will, however, be needed to get at the right result, for the weight may actually be increased by cutting down a diet that has been excessive—an effect which I have seen more than once.

Further, before we can arrive at the normal weight we must make due allowance for age, sex, and idiosyncrasy. Middle-aged people normally incline to stoutness, and the aged to leanness; young women are naturally stouter than young men; and some, again, are by nature thin, and others stout, irrespectively of age and sex.

Actual Quantity of Food Constituting a Sufficiency.—A man doing a fair amount of muscular work takes on an average about 3 pounds—*i.e.*, 48 ounces—*per diem.* For a professional man taking little exercise 30 ounces a day constitute a fair average. The middle diet of uy's Hospital totals up to 29½ ounces, and this for tients who are taking little or no exercise. Some ple appear to do well on a much smaller allowance

of food, but we must not too readily accept them as criteria for the many. Such are evidently endowed with very efficient powers of digestion, and are probably anabolically disposed. Many of them, as might be expected, are past middle life, when metabolic activity tends to slacken. The miller of Billericay is said to have lived in vigorous health for upwards of eighteen years on a daily allowance of 16 ounces of flour made into a pudding with water; and the celebrated Cornaro, who lived to be nearly 100 years old, limited his food to 12 ounces daily, supplemented by 14 ounces of wine. I have myself met with cases in which the daily diet has been no more than this.

By thoroughly masticating and insalivating the food nutrition can, as Horace Fletcher and Van Someren have shown, be maintained on a smaller quantity than when mastication is less thorough. This is evidently because mastication facilitates digestion: the more perfect the digestion, the more economically are the nutritive ingredients dealt with by the organism; in fact, as Dr. Keith observes, when digestion is perfect, a meal can at any time be omitted without discomfort. This helps to explain how it is that a person can educate himself to subsist upon progressively smaller quantities of food. If one accustomed to eat to excess suddenly diminishes his daily allowance, he may complain that he is being starved, that he feels "faint for food," and that he needs more "to support him." This is because his entire organism, but especially his digestive system, has become so accustomed to a copious diet that it cannot quickly adapt itself to the sudden curtailment. Above all, he misses the mechanical stimulus of a large mass in his alimentary tract, and the chemical stimulus of the more stimulating ingredients (such as extractives)

of the food. The morbid craving for food from which the excessive eater is so wont to suffer is indeed rather a craving for this mechanical and chemical stimulus than for nutriment, and as regards the latter is exactly analogous to the drunkard's morbid craving for alcohol, and the opium-eater's for opium. But by education the excessive eater can overcome this craving, and his system can be made to acquire such habits of economy as to make comparatively little go quite as far as a superabundance. This economical disposal of the food is doubtless, as has been said, chiefly effected by the digestive organs, though it does not seem improbable that the tissues generally may be educated into thrifty habits.

How to Reduce a Sufficient Diet to the Minimum.—When, as in grave affections of the heart, lungs, or kidneys, it is desirable to reduce the dietetic requirements of the organism to a minimum, and thus give the failing organs as little work to do as possible, the physician should endeavour to procure the completest possible quiescence of the muscular system, and to minimize the loss of heat. He therefore keeps the patient in bed, tells him to be quiet and relax his muscles to the utmost, maintains a warm temperature in the room, gives all food and drink warm, and covers the entire body, save the head, with some light non-conducting material.

Old age, the female sex, and a sluggish metabolic habit are the intrinsic conditions most favourable for the reduction of diet.

An Insufficient Diet.—The evils of an insufficient diet are too well known to need mention here.

While recognizing the limit beyond which insufficient diet becomes starvation, the physician should ever bear

in mind that life, especially after maturity is reached, can be sustained for a considerable time without any food whatsoever, if only the body is well nourished to begin with. The public have a great idea of "keeping up the patient's strength," and believe that the most effectual way to do this is to cram as much food as possible down his throat. They fail to realize that a person, especially if kept warm and quiet in bed, can go on living for a considerable time entirely without food, and that this period can be lengthened almost indefinitely by giving very small quantities daily. One constantly sees patients subsisting for weeks together on nutrient enemata alone. It is, in fact, no easy matter to kill a patient by starvation. I sometimes smile at the incredulity expressed both by the patient and his friends when I tell some overfed, elderly sufferer from bronchitis, who is being suffocated by a superfluity of fat, that he could live for some days—and with advantage—without any food at all. I do not hesitate to say that very many more patients die from being overfed than underfed, especially in acute affections of the heart and lungs.

How long life can be sustained without food has been shown by the experience of professional fasters. Death from starvation does not generally occur until the body has lost one-third of its normal weight—until, *e.g.*, the weight has fallen from 12 stones to 8 stones.

CHAPTER XXXIV

AN EXCESSIVE DIET

ANIMALS in a state of nature are little likely to over-eat, and this for several reasons: first, because they are often hard put to it to find enough for their sustenance, their search after food entailing an incessant activity which can only be maintained by a correspondingly ample supply of nutriment; secondly, because their food, except in the case of the carnivora, is seldom in a highly concentrated form; and finally, because it is of such simple and monotonous kind that appetite is satisfied when a sufficiency has been ingested. Civilized man, on the other hand, is not compelled to lead a physically active life, with the result that he often takes little or no exercise. His diet is highly concentrated, such articles as sugar, butter, cheese, and meat forming a large proportion of it; and far from being monotonous, it is exceedingly varied, and, moreover, in the case of the well-to-do, is rendered tempting, even after hunger is appeased, by the manifold resources of the culinary art.

While, then, it is practically impossible for wild animals habitually to over-eat, the human being of to-day has many inducements to exceed and, as a matter of fact, often yields to them, men being in this respect greater sinners than women.

EVILS OF OVER-EATING.

Over-distension of the Stomach.—One of the immediate effects of a surfeit is undue distension of the stomach, which may lead to dilatation of that organ, and also, by thrusting the diaphragm upwards, to interference with the breathing and the action of the heart.

It should be remembered in this connexion that meals which are few and far between are apt to be unduly bulky, and it is further to be noted that a diet may be unduly bulky and distend the stomach even though not excessive in the sense of containing too much nutriment. The error may be in eating bulky foods, such as vegetables and other food producing flatulence, or in drinking large quantities of fluid with the meal. The last-named is a bad practice. It is now known that very little liquid is absorbed by the stomach, and consequently, when fluids are taken with meals, instead of escaping rapidly into the bowel, as happens when they are taken fasting, they are retained in the stomach, only passing out gradually with the food; and further, it is possible that when much fluid is taken at meal-time, it may retard digestion by diluting the gastric juice. Drinking is also used as a means of softening the food and washing it down, and it may thus do harm by encouraging inefficient mastication. Liquids should therefore be taken, for the most part, on an empty stomach—say half an hour before meals—in order to give time for them to leave the stomach before food enters it. Hence the advantage of giving aperient salines the first thing in the morning.

Excessive Storage of Fat.—The most obvious evil resulting from chronic over-eating is obesity. Though

this condition is sometimes a manifestation of disease, it is generally due to over-eating. People who take little exercise often require very little food. Those leading highly active lives are but rarely obese. I do not remember ever to have seen a fat postman, and one seldom finds navvies encumbered with fat. Let the fact, then, honestly be faced by the obese that, except in rare instances, inordinate fatness is due to over-eating, and should be met by apportioning the diet to the needs of the system. (Over-eating, it should be noted, by no means necessarily implies the taking of large quantities of food.)

Circulatory Troubles.—Cohnheim gives cardiac hypertrophy as one of the results of gormandizing. When a large quantity of food is taken, there is substantial augmentation of the heart's action from the increased activity of the splanchnic circulation. An excess may, moreover, disturb the action of the heart by distending the stomach, by inducing obesity, by increasing peripheral resistance (of which more later), and, finally, by hampering respiration. If therefore we are dealing with a case of grave cardiac failure, when we desire to save the heart as much as possible, it is imperative to reduce the diet to a minimum.

Plethora.—Just as starvation tends to impoverish the blood and to diminish its mass, so may overfeeding cause over-richness of the blood, and possibly also an augmentation of its mass, though it is possible that in such cases the condition is rather one of arterial plethora from heightened peripheral resistance.

Anæmia.—Over-eating may lead to disease of the chromocytes, probably by inducing toxæmia.

Respiratory Troubles.—Over-eating, by distending the stomach, causes an encroachment upon the pul-

monary area ; by inducing obesity it leads to restriction of the respiratory movements ; by disturbing the action of the heart it interferes with the circulation through the lungs ; and by promoting toxæmia it predisposes to inflammatory affections of the lungs and bronchi, as well as to asthmatic seizures. Nor does this exhaust the list of the respiratory troubles resulting from it. Over-eating affects the heart in another way, which has been strangely overlooked. As we shall see, every particle of absorbed food which is not stored nor eliminated unkatabolized as sugar or albumin has to be burnt off within the organism, and that, too, very soon after absorption. Now, this combustion of food causes oxygen to be used up and carbonic acid to be formed, and consequently the *larger the amount of food ingested and absorbed, the larger is the demand for oxygen, and the larger the quantity of carbonic acid produced*—in other words, the greater the respiratory interchange, and the more ample the respiratory movements. *Hence, in all cases of dyspnœa we should give as little food as we dare.*

EVILS DUE TO FAULTY METABOLISM IN THE DIGESTIVE TRACT OR THE TISSUES.

Before discussing these it will be well to trace the behaviour of the redundant food within the body. When a redundancy is taken, an excess of nutritive ingredients is absorbed into the blood. Some of this excess may pass out of the kidneys unkatabolized, as sugar or albumin, but except in the case of disease, this only occurs after large surfeits. Some, again, may be stored ; but, speaking generally, only a small proportion of the total excess is dealt with in this way. What, then, becomes of that larger proportion which is neither stored nor passed out of the body unkatabolized ? The

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reply is, It is katabolized—*i.e.*, the organism is put to the labour of burning off the excess of fuel, the fats and saccharides being converted into carbonic acid and water, and the proteids into these and also into urea, uric acid, and allied compounds. This excessive katabolism takes place chiefly in the muscles.

Is it not remarkable that no provision has apparently been made against a chronic excess of nutriment? that, instead of altogether refusing to absorb it, or, after having absorbed it, either storing it or simply running it out unchanged, the organism should be at the trouble of katabolizing it? This stands out as one of the most remarkable facts in the physiology of nutrition. For observe what such redundant katabolism implies. Not only does it throw so much extra work upon the digestive viscera and the muscular system; not only does it put so much extra strain upon the heart, the lungs, and the excretory organs; but it further leads to the unlocking of a store of energy which, far from being of use to the organism, is but an embarrassment. We are apt to lose sight of the fact that every katabolic change is attended by an unlocking of energy, and that therefore redundant katabolism implies waste of energy. This waste-energy takes the form of heat. All, or practically all, the energy of the organism manifests itself as work or heat, most of the former being converted into the latter within the body, and passing off from it as such; thus all the "internal work" (movements of the heart, etc.) of the body is converted into heat, and during rest practically the *whole* of the energy unlocked by katabolism is dissipated in this way. It will therefore be seen that the surplus energy set free by the redundant katabolism consequent on over-eating must also leave the body as heat, and that the larger the amount of

food absorbed, the greater must be the amount of heat emitted. Gourmands, therefore, must emit more heat than spare eaters, and this involves on their part either the wearing of correspondingly scantier clothing or increased evaporation from the skin and the lungs. As a matter of fact big eaters generally perspire freely.

There is yet another aspect from which we may view this superabundant katabolism, with its corresponding evolution of energy. Just as chronic starvation leads to lack of energy, producing listlessness and apathy—Mr. Bumble, it will be remembered, well knew that the half-starved inmates of his workhouse had "little stomach" for fighting—so, conversely, chronic over-eating is apt to cause trouble by leading to an undue accumulation and ebullition of energy in the organism, and this surplus may seek outlet in abnormal ways, such as in fits of irascibility and hysterical convulsions. The impulse of the irascible man to break the furniture, and of the hysterical woman to scream and rush wildly about, must surely be intensified by the storage of an excess of energy. I do not want to overestimate the influence of this factor in provoking nerve-storms—other factors, such as toxæmia, play their part—but it will certainly be conceded that surplus energy is apt to find an abnormal outlet. If a well-fed horse is not taken out to exercise, he will kick his stable down, and over-fed prisoners may, from the very fact of their being over-fed, be incited to insubordination. These considerations suggest that when there is a morbid tendency to ebullitions of nervous energy, great care should be taken to keep the diet within strict limits.

We have now to inquire whether the redundant katabolism of the large eater is the same in kind as the non-redundant katabolism of the moderate eater. It is

probable that in the former case the katabolic products are more toxic than in the latter, and this brings us to a consideration of the most serious, because the most wide-reaching, of all the evils due to over-eating: I refer to toxæmia. I cannot too strongly urge that if we desire to keep down blood-toxicity, we should zealously guard against excesses in eating. In the first place, the excessive katabolism thus necessitated leads to an excess of waste-products, and these probably more than usually poisonous; and in the next place, over-eating may further increase the toxæmia by setting up dyspepsia.

It is incontrovertible that digestion is more likely to reach a high grade of efficiency when just enough than when too much food is taken. Now, the more efficiently digestion is carried on, the fewer are the poisons produced in the alimentary tract, and the less is their absorption into the blood.

The following are some of the chief troubles resulting from the toxæmia of over-eating:

Inflammation.—The toxæmia caused by gluttony may set up inflammation in any part of the body, and this indirectly—*i.e.*, by lowering the resistance of the tissues to microbic invasion—as well as directly. In such an inflammation as gouty bronchitis the toxic action is direct. In certain cases of suppuration—*e.g.*, sty in the eye—it may be indirect, the influence of intestinal sepsis in favouring the activity of the pyogenic cocci in this disorder being shown by the beneficial effect on it of a brisk purge. Indeed, it may be said that in all inflammation one of our chief aims should be to diminish gastric and intestinal toxæmia.

Among the many toxic inflammations caused by over-eating gastritis and enteritis occupy a prominent place, the poisons engendered within the alimentary canal as

the result of defective digestion causing inflammation of the lining mucous membrane. The enteritis of slum-bred children ("consumption of the bowels"), though due rather to improper than to excessive feeding, is produced in the same way, but here the toxæmia is so profound as to lead to a general perversion of nutrition. As a result, the child is ill-grown and anæmic, with thin transparent skin, long silky eyelashes, and a complexion often strongly suggestive of the toxic state of the blood. In the old days such children were said to have the strumous diathesis, which was thought to be a congenital condition, but I have little doubt that it is essentially acquired. Mere starvation will not produce it; it is a condition of perverted nutrition, due to prolonged tissue-poisoning of gastro-intestinal origin. I have referred to these cases because they show how grave and extensive are the evils which may result from dietetic errors.

Cardio-vascular Disturbance.—The toxæmia of over-eating may produce functional disturbances of the cardio-vascular system, such as palpitation and vaso-motor disorder. Flushing, or "rushing of the blood to the head," is one of the most common of these latter; another and more pernicious effect is a generalized constriction of the systemic arterioles, giving rise to increased pressure in the whole systemic arterial tree, which, together with the left heart, thickens and eventually degenerates in consequence. Thus it comes about that the cardio-vascular system wears out sooner in the gourmand than in the spare feeder. Many are the dangers which beset the path of the gourmand, but perhaps the greatest are those pertaining to this system; he often dies from the failure of a prematurely worn-out heart, or from rupture of a degenerated blood-vessel.

Degenerations.—Again, the toxæmia of over-eating

may lead to degeneration in connexion with the inflammations and the cardio-vascular changes just considered. It may also do so in other ways. The constant soakage of the tissues with toxins injures their delicate protoplasm, which thus tends to degenerate prematurely, its place being taken by fibrous tissue. Thus over-eating hastens that fibrous encroachment which is a natural senile change. As we should expect, the liver and the kidneys are especially apt to suffer. Chronic over-eating causes chronic engorgement of the former organ, and imposes upon it an amount of work far in excess of its powers; it also increases the work of the kidneys and exposes them to constant irritation by the toxins which they are continually excreting.

Gout.—Over-eating is one of the chief causes of gout, which is essentially a toxæmia. The errors of diet which cause it pertain not merely to the kind of diet taken, but to its quantity also, and indeed chiefly. We are too much in the habit of telling our patients, gouty and other, to avoid this or that article of diet, without adequately insisting upon the importance of keeping the quantity of food within proper limits. Gout can in many cases be cured by attention to this particular alone.

Nervous Disorders.—Lastly, the toxæmia of over-eating may set up a variety of nervous disturbances, such as headache, tinnitus, irritability, depression, drowsiness, lassitude, numbness, flushings, pains about the body, weakness, or even partial paralysis, of the muscles, while neuroses of all sorts tend to be aggravated, if not actually induced, by it.

AGE IN RELATION TO OVER-EATING.

In youth, as we have seen, there is greater capacity to deal with excess of food than in old age; the organs

of digestion and excretion are then most vigorous and metabolism most active, the vital fires blazing fiercely, so to say, while the restless activity of the muscular system not only diminishes the likelihood of chronic excess, but also helps to mitigate its evils. In old age, on the other hand, there is a growing tendency to quiescence of the muscular system, side by side with a waning in digestive and excretory vigour, and an increasing sluggishness of metabolism generally; in other words, the vital fire no longer blazes, but rather glows and flickers dimly, and stands in danger of being extinguished altogether by the accumulation of ashes. Yet at this very time we may find the individual more than ever addicted to the pleasures of the table, and with an appetite and capacity for enjoying food altogether in excess of the requirements of his system. The use of artificial teeth is not an unmixed blessing to the aged; it may do harm by encouraging them to eat more food than is good for them, and of a kind unsuited to their years. It is noticeable that almost all the country-folk who live to a great age rely upon their toothless gums.

It is chiefly in middle life that the evils of over-eating begin to show obtrusively, becoming more and more insistent with every advancing year. We may sometimes see an old man of sedentary habits—old women less frequently err in this respect—whose appetite and enjoyment of food survive amid the general decay of his physical powers, loading his poor old stomach with the same quantity of food and alcohol as he consumed in the heyday of his active manhood, and expecting his stomach, liver, and kidneys, after threescore or more years of over-work, to perform the same physiological feats as in their prime, and generally with the result that

he becomes a nuisance alike to himself and to those about him. It is true that some can gormandize into extreme old age without much apparent harm, but such cases are exceptional. Almost all centenarians have been moderate eaters. I cannot too emphatically insist upon the desirability—nay, the urgent necessity—of keeping the aged on a spare diet. Do not let us extinguish the flickering fire of age by piling on too much fuel.

Young people, too, in spite of their great katabolic activity, often suffer from over-eating, notably infants and very young children. Not only is food given them in a highly-concentrated form, consisting of almost pure proteid, starch, sugar, and fat, with very little unabsorbable material, but it is administered in a soft or liquid form, which allows it to pass with a fatal facility into the stomach. The modern infant is often, in fact, much in the position of the far-famed Strasburg goose. At a period of life when it is a stationary animal, and prevented from working off an excess of food by abundant muscular activity (which same activity is but too often still further limited by unsuitable clothing), its digestive organs are burdened with an excess of richly nutritious foods, with results the most disastrous to the helpless victim.

Older children may be similarly victimized. I know the case of a mother who was obsessed with the idea that the more food she could cram into her only child, a boy of eight, the stronger he would grow. She would stand over him when he was already gorged nigh to bursting, and entreat him to take "just a little more," and the child, with flushed face and protruding eyes, would say, "Oh, mother, *must* I?" then, with a heavy sigh, "Mother, I *can't!*"

SAFEGUARDS AGAINST OVER-EATING.

Vomiting. — Sometimes an overloaded stomach relieves itself by disgorging its contents. So-called "bilious vomiting" may also act as a safeguard against chronic excesses in eating. Such attacks are generally migrainous in nature, and they benefit partly by acting mechanically upon the liver and so ridding the system of much noxious material, and partly by securing a period of starvation, perhaps an entire day, if not longer. Thus migraine is sometimes a blessing in disguise. Nor is it the only complaint of which this may be said.

Illness of any kind frequently benefits by compelling abstinence, and affording the organism at least a temporary respite from prolonged excesses. The gouty man gets his periodic upsets, which necessitate a break, however short, in his habitual indulgence, and there are few, even among those who live most carefully, who do not have their occasional bouts of "seediness," in which, to the advantage of the system generally, the appetite flags and less food is taken than usual. Even the gravest illnesses, such as enteric fever and cholera, may do good in this way. I have seen some remarkable instances of chronic dyspeptics entirely cured of their indigestion, and improved in health generally, by a long and severe illness.

Fasting.—And here I may fittingly refer in passing to the salutary physical effects, whatever the mental, of religious fasting. One day's abstinence from meat in the week represents more than seven weeks' abstinence in the year, and nearly ten years out of seventy, and the beneficial effect such a practice may therefore have in the course of a long life can only be properly estimated

when we reflect that, as with drinking, so with eating, it is the steady, uninterrupted, day-by-day excess that is injurious, when the organism is allowed no respite, no opportunity of recovering itself from the injury inflicted; a harmful practice which, when indulged in for a short time may cause no appreciable permanent damage, leads, if steadily persisted in, to serious evil. It is the old story of the drop of water and the stone. It is well known that drunken bouts, provided that they are separated by fairly long intervals of complete abstinence, may work little lasting harm, and that it is the habitual sot, who never gets drunk yet is never quite sober, that suffers most from the effects of drink. Even small quantities of alcohol continued daily for years may be pernicious. A patient perhaps assures us that he drinks very little, but when the total yearly quantity is reckoned up it will give a surprisingly large amount. Even so moderate a quantity as two glasses of whisky a day totals eighty bottles in the year and 800 bottles in ten years; and when it is reflected that the whole of this has to go through the liver, it is clear that there is plenty of opportunity for that organ to be damaged by the daily consumption of two glasses only, and that an occasional abstinence for a few days, or even one day, may easily be beneficial. And what is true of alcohol is true also of tea, coffee, and tobacco, as well as of certain articles of diet, such as meat and eggs, all of which may with advantage be abstained from occasionally. Whatever, therefore, our views on fasting as a religious exercise, as physicians we cannot but recognize its value when not carried to extremes.

Hæmorrhages.—Spontaneous bleeding—*e.g.*, from nose and rectum—may relieve the plethora resulting from over-eating. Whether or not there is an actual

increase in the blood-mass in these cases, it is certain that the flushings, giddiness, and other unpleasant symptoms which attend them, are benefited by bleeding, spontaneous or artificial, and in the old days bleeding was resorted to in cases of this kind with great advantage. There can be little doubt that the periodic flux in the woman tends to counteract the evils of over-eating. It is scarcely necessary to say that when a spontaneous hæmorrhage—*e.g.*, epistaxis—occurs in a subject of high blood-pressure, we should seek rather to promote than to arrest it, a procedure which may expose the patient to the grave risk of cerebral hæmorrhage.

Purgatives. — The evils of over-eating may be lessened by the free use of saline purgatives, a method systematically carried out at Homburg, Marienbad, and similar spas. A blue pill and black draught constitute the favourite expedient of the gourmand. Salines, it should be noted, benefit not only by favouring the elimination of poisons but by diminishing the absorption of food.

REDUCTION OF DIET AS A THERAPEUTIC MEASURE.

How to Deal with a Case of Over-eating.—Our object in a case of chronic over-eating is to reduce the daily diet to a sufficiency, and generally it is advisable to do this gradually. Thus we may tell the patient to omit every second course in the principal meal, never to take a second helping, to leave off eating directly a feeling of moderate satiety sets in, and so forth. If he will not submit to a reduction of his diet, we have to be content to counteract his excesses, as far as may be, by urging an active open-air life, and resorting to blue pill, salines, or even bleeding. If the appetite is inordinate, we should prescribe plain,

monotonous food and the avoidance of dishes calculated to tickle the palate ; or we may seek to blunt the appetite by getting the patient to take a glass of milk and a piece of bread-and-butter just before the main meal; or, again, we may try to cheat the stomach, as it were, by the free employment of food containing a large proportion of unabsorbable material—*e.g.*, green vegetables, which by their mere bulk tend to create a feeling of repletion.

Periodic Fasting.—Sometimes we may find it advisable to recommend all food to be withheld for the entire day, or a single meal to be omitted, or such articles as meat and eggs to be temporarily eschewed. A mode of fasting which sometimes yields good results, and which has been widely advocated in America, is the omission of breakfast. I have heard of a physician who does not allow his gourmand patients any food before 11 a.m. and then only a warm decoction of chocolate rusks, the object apparently being to give the stomach rest and to wash out the tissues by means of a harmless fluid.

Obesity.—The treatment of obesity consists essentially in cutting down the diet and enforcing exercise. A simple reduction in the total quantity of food may suffice, but the more effective plan is to eliminate, as far as possible, fats and saccharides from the dietary. Even those who are only slightly above the normal weight, say one stone, may sometimes be greatly benefited by having their weight reduced to the normal. One stone less to carry about the world may be no small gain, *e.g.*, in the case of an elderly man whose heart and lungs are working to the utmost limit of their capacity.

In reducing the weight we must have due regard to

the rate at which the reduction is effected. With some it is possible to proceed much more rapidly than with others. We must be guided by the way in which the patient responds to the dietetic curtailment.

Lung Disease, Dyspnœa.—In treating affections of the lungs, more especially when dyspnœa is present, the utmost caution should be exercised regarding the quantity of food allowed. With the exception of certain cases of phthisis, in which gorging for a limited time may undoubtedly do good, we may broadly say that in all serious pulmonary affections not one particle of food over and above a bare sufficiency should be given. Dyspnœa being due to an excess of CO_2 in the blood, we should manifestly seek to reduce the production of this substance to a minimum, and the best way to do this is by retarding combustion. This retardation we effect by securing rest, keeping the patient warm, and limiting his food. Let us ever remember, when we see a patient gasping for breath, that every particle of food over and above a bare sufficiency must inevitably increase his distress, and this not only by increasing combustion, but also by putting extra work upon the heart at a time when it is imperative to save that organ as much as possible. In these cases we should be careful, too, to choose a non-flatulent diet, for a flatulent abdomen does harm both by thrusting up the diaphragm (thus dislocating the heart, already perhaps in desperate straits) and by crumpling up the lungs, which stand in need of every available air-cell.

A disease greatly benefited by spare diet is bronchitis, especially that form which occurs in the elderly and the aged. When bronchitis occurs past middle life, it is in a large number of cases induced, and always aggravated, by over-eating. We can, in consequence,

often produce effects little short of miraculous simply by curtailing the diet.

Asthma.—Among the affections benefited by a sparse dietary asthma occupies a prominent place. When the patient is a high feeder, improvement always, in my experience, follows upon a reduction in the diet.

Heart Disease.—I have already pointed out how important it is in all cases of failing heart not to give too much food. In high arterial tension, more especially when we apprehend the rupture of a cerebral blood-vessel, we must be careful not to allow one particle more food than is physiologically necessary; in extreme cases, indeed, we must not hesitate to withhold all food for a time, and to supplement this treatment by free purgation and even bleeding.

Gout.—This affection being largely due to over-eating, the gouty should at all times be especially careful to take no more food than is just sufficient. With them I venture to think it is quantity rather than quality that they have to be careful about. An excess of saccharide food is probably quite as injurious to the gouty man as an excess of proteid.

Nervous Affections.—Most of the nervous affections due to over-eating, such as headache, giddiness, irritability, and asthma, may be of a gouty nature; but whether we regard them in this light or not—and the term "gouty" is sufficiently vague—the obvious indication is to reduce the amount of food ingested. In some nervous disorders—*e.g.*, epilepsy—the appetite may be voracious, and we have to be on our guard against this.

Bright's Disease.—In all forms of Bright's disease the total supply of food should be no more than a sufficiency.

Febrile States.—In extreme fever, when digestion is

completely or partially in abeyance, and especially when the patient has sunk into the typhoid state, it is a great mistake to worry him by continually giving nourishment—far better withhold all food for a time.

TREATMENT BY AN ABUNDANT DIET.

If the patient is below his normal weight, we endeavour to raise it to the normal by increasing his diet. *Always seek to get the patient down to or up to (as the case may be) his normal weight.* The physician who insists in putting this simple principle into practice will not have lived in vain.

Patients below the normal weight benefit by rest, and we should therefore curtail their muscular activity at the same time that we increase their diet. When, however, the normal weight has been reached, care must be taken not to allow the augmented diet to be kept up too long, or we may induce an entirely new order of troubles; and the older the patient the more urgent is this precaution.

The subjects dealt with in the last six chapters have been more fully treated of by the writer in the following papers:

"Observations on Diet" (four papers), *Lancet*, 1902.

"Observations on Mastication" (six papers), *Lancet*, 1903.

"The Evolution of Man's Diet" (nine papers), *Lancet*, 1904.

"The Diet of the Pre-cibiculturists" (nine papers), *British Medical Journal*, 1905.

CHAPTER XXXV

THE RELATIVE PROPORTION OF PROTEIDS, FATS, AND SACCHARIDES

It is not enough that a dietary shall include proteids, fats, and saccharides: these substances must be present in the right proportions. A dietary may be too rich or too poor in any one of them. Thus proteids and fats may be in excess and saccharides deficient, as is not infrequently the case in the diet of the well-to-do, who are apt to consume a large amount of animal food (including butter and cream, which enter into the composition of many sauces and "made" dishes), and but little vegetable food; or, again, saccharides may be in excess while proteids and fats are deficient, as in the food of the poor and of children of all classes.

Such an imperfect balancing of the various constituents of the dietary may seriously injure health.

An excess of proteids tends to give rise to an accumulation of nitrogenous waste-products, which may cause gout, rheumatism, and allied disorders, though it is possible that many of the evils commonly attributed to the excessive ingestion of proteids are due not so much to the proteids themselves as to the associated extractives which are abundant in most animal foods, in which form proteids are for the most part in-

gested. (It is doubtful if an excess of proteids in the form of plasmon, protene, and similar foods produces the same harmful effects as when taken in the form of meat.) A deficiency of proteids, on the other hand—say less than 40 grammes a day—causes diminished vitality, low resistance to disease, lack of nervous energy, and flabbiness of the tissues (due, it is said, to an excess of water and fat), all of which evils are apt to be manifested in the pure vegetarian unless the items in his dietary are properly selected.

As regards fat, an excess may produce "biliousness"; while there can be no doubt that a deficiency is, in many cases at least, detrimental to health, especially, perhaps, in children.

Coming now to saccharides, it is well known that an excess of either starch or sugar may cause flatulence and acidity, and also promote gouty and "rheumatic" affections, while a deficiency of them may be harmful in leading to an excessive consumption of animal food.

It will thus be seen that it is of no little importance to the physician to know what should be the proper proportions of the three great classes of food-stuffs—proteids, fats, and saccharides—to make the dietary ideal. It is easy enough to *define* the ideally-proportioned diet: clearly it must be that which would enable a person to maintain his normal weight and his highest health-level on a minimum quantity of food; for if in a dietary the various food-stuffs are not properly balanced, more food will be required to secure these ends than if they are—in other words, there will be a wastage of energy. It will thus be seen that by correctly proportioning the food-stuffs we are able to effect a physiological economy, the organism maintaining its highest level of nutrition on the minimum of food.

But while it is not difficult to define an ideally balanced dietary, it is by no means easy to say what the *actual proportions* of the food-stuffs composing it should be; for we find not only isolated individuals, but whole communities, thriving upon dietaries in which the nutrient ingredients exist in widely different proportions. Thus some peoples, like the Esquimaux, subsist almost entirely on flesh and consume enormous quantities of fat; while among others, such as the rice-eating peoples of the East, the diet contains a large preponderance of saccharides. In such cases as these the character of the food is determined by necessity: the Esquimaux can obtain animal food but the cold regions which they inhabit are all but incapable of yielding them vegetable produce; and, on the other hand, in many of the great rice-growing districts of India animal food is scarce and rice constitutes of necessity the staple article of diet.

Doubtless a community which for several generations has subsisted on a particular dietary tends by natural selection to become racially adapted to it. Nor must we neglect the influence of personal adaptation as well: a person tends to become adapted to the dietary to which from childhood upwards he has been accustomed.

When, then, we consider how greatly communities, and individual members of the same community, differ from one another in their dietetic habits, we see how difficult—nay, how impossible—it is to fix a rigid, stereotyped dietetic standard for mankind at large. The fact is, man is extraordinarily adaptable in the matter of diet, and we need to be very cautious in dogmatizing as to what he can and what he cannot thrive on. Nevertheless, making due allowance for racial and individual adaptation, we are probably justified in assuming that there are certain more or less definite proportions in which

proteids, fats, and saccharides combine to constitute the diet most suitable to the average man.

But how to determine these proportions? A very reasonable way is by comparing the dietetic customs of different communities for whom a liberal supply of all those food-stuffs is available; if among their dietaries we find a tendency towards certain proportions of each, a diet composed of proteids, fats, and saccharides in those proportions may be very fairly accepted as forming an approximate standard-diet for the average individual. We are especially guided in this matter by studying the dietaries of public institutions—hospitals, workhouses, and prisons—in various parts of the world, dietaries which have been empirically arrived at as the result of long experience. Striking the mean of these, we obtain something like the following proportions:

Proteids	1
Fats	·75
Saccharides	4·5

In other words, proteids should be given in somewhat larger quantity than fats, while the quantity of saccharide should be four or five times as much as that of proteid. But even when arrived at, such a standard applies only, be it noted, to man in the aggregate: we cannot be sure that it is applicable to any one individual. Each is a law to himself in this matter; to each some particular combination of proportions is more suitable than any other.

Passing now from proportions to actual quantities, we arrive at a daily dietary something like the following:

Proteids	120	grammes.
Saccharides	540	"
Fats	90	"
Salts	—	
Water	—	

This quantity of proteid has long been accepted by physiologists as the proper daily allowance for the average adult. Professor Chittenden has, however, recently shown by an extended series of experiments on a number of professors, soldiers, and student athletes that health can be maintained on less than half this amount, and in some cases, indeed, on little more than a third; and he further claims that on this reduced proteid intake health is better than on the larger one.

But while admitting that his experiments seem to show that the requisite amount of proteid has been fixed at too high a figure, we must not hastily conclude that in order to preserve health it is necessary to reduce the daily allowance to 50 grammes or less. Chittenden rightly insists that the products of nitrogenous katabolism are more poisonous than those of carbonaceous katabolism, and it is by reference to this fact that he explains the improvement of health under a reduced proteid intake observed in the men he experimented upon. I am, however, by no means sure that this explanation is sound.

In the first place we have to remember that certain peoples not only subsist but actually thrive on a purely animal diet—one, *i.e.*, consisting of large quantities of proteid and fat. (This latter has always to be abundantly consumed when the diet is chiefly or entirely animal.)

Then, again, we must not lose sight of the fact that in all the men experimented upon—professors, soldiers, and athletes—there was a reduction not only in the proteid intake but in the total quantity of food ingested, and the good that may accrue from reducing an "excessive" to a "sufficient" diet has already been insisted on.* Thus, in reference to the athletes,

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we are distinctly told that "no specific dietary was imposed, but the men, being willing collaborators in the experiment, gradually cut down the intake of proteid food, *diminishing likewise in considerable measure the total volume of food for the twenty-four hours.*" And a similar statement is made in regard to the other two classes experimented on.

Finally, the professor must account for the fact that it is often possible greatly to improve health by restricting the carbonaceous food and allowing an abundance of proteids. Thus migraine, asthma, gout, and a number of other disorders which can often be benefited by a "purin-free diet"—one, namely, for the most part of low proteid intake—can, as Dr. Francis Hare insists and as I have myself observed, be equally, if not more, successfully treated by reducing the carbonaceous intake and allowing the proteids to take care of themselves. Hence the seeming paradox that we may be able to cure one and the same patient (suffering, say, from migraine), either by cutting off meat and bird, or by reducing his intake of starch, sugar, and fat while allowing a liberal supply of meat and other animal food. I have been accustomed to explain it by assuming that the benefit on each plan of treatment results essentially from improved digestion and the consequent reduction in the toxicity of the blood, which I have supposed to be an important factor in the etiology of the disorder which has yielded to the treatment. We may assume, in fact, that whereas a diet containing a liberal supply of both proteids and carbonaceous food is inefficiently dealt with by the digestive organs, a diet consisting chiefly of the one or the other undergoes more perfect digestion, and thus conduces to a more healthy condition of blood-plasma.

Hare, however, gives a different explanation. He believes that many disorders—migraine, asthma, and acute articular gout, among others—may be caused by excess of carbonaceous material in the blood (a condition which he terms hyperpyræmia), and that the effect of either plan of dieting is to reduce this hyperpyræmia. He contends that there is a much greater tendency for carbon to accumulate in the blood than for nitrogen, for whereas the ingestion of nitrogenous food is rapidly followed by an augmentation in the excretion of nitrogen—witness the rapid rise in urea-excretion after a proteid meal—there is no such rapid rise in the output of CO_2 after food, whether saccharide, fat, or proteid (two-thirds of which, it should be noted, is carbonaceous). There are, it is true, physiological means by which the organism can dispose of this excess—*e.g.*, storage (as fat or glycogen), combustion (as in muscular contraction), and the menstrual flux; but these means may be inadequate to prevent hyperpyræmia, and when this condition occurs it tends, according to Hare, to culminate in an attack of migraine, asthma, gout, or other disorder, the effect of which is to reduce the hyperpyræmia, either by lessening the intake of food (as in migraine), by increasing muscular contraction (as in asthma), or by pyrexia (as in gout). Such disorders Hare therefore regards as quasi-physiological.*

Regarding the circumstances which influence the relative proportions of food-stuffs suitable for individual cases, it must be confessed that we know very little, and the following observations on the subject are only tentative:

* For a more complete account of Dr. Hare's views the reader is referred to that physician's highly original work "The Food Factor in Disease."

CLIMATE.

In cold climates and cold seasons the proportion of fat in the dietary should be high. Hence the fat which enters so largely into the tissues of the Arctic animals constitutes a valuable article of diet for Arctic man. The Arctic animals themselves stand in need of large quantities, both to serve as fuel for the production of heat and to build up that thick subcutaneous coating of adipose tissue which serves as a protection against the excessive cold. That life in cold climes needs a large supply of fat to sustain it is proved to demonstration by the richness of the milk of Arctic mammals in this substance, and is borne out by the experience of Arctic explorers: thus Nansen, in the account of his journey across Greenland, refers to the insatiable craving for fat which beset his party. It is significant, too, that the seeds of plants growing in Northern regions are peculiarly rich in it.

AGE.

During the period of growth the organism requires a larger proportion of proteid than after full maturity is reached. An ample supply is especially needed when growth is most rapid — *i.e.*, during the first months and at the time of puberty, for it is from this substance alone that bioplasm can be built up, and it is an interesting fact that the quantity of proteid in the milk of different animals bears a definite relation to the rate of growth of their respective young, the most rapidly growing mammals yielding milk which is richest in proteid.

Fat also should be well represented in the dietary of growing children, and not ousted, as it so frequently is now, by a superabundance of saccharide. It

must nevertheless be confessed that some appear to thrive on a super-saccharide diet into which proteid and fat enter sparingly, and it is not rare to find children who exhibit a disinclination to meat and fat, though it is probable that most of these would be all the better for a more liberal allowance of both.

MODE OF LIFE.

When a man is training for an athletic contest involving a great call on the muscles, it has generally been thought needful to increase the proportion of proteid in his diet and to diminish that of fat and saccharide. One object of training is to induce muscle-hypertrophy, and it is assumed that such an increase in bioplasm demands a generous supply of proteid ; another object is to keep down weight, and this is effected by reducing the proportion of fat and saccharide. This is the system which boys training at school have found out for themselves, and there can be no doubt as to the value of it, for, as Clement Dukes points out, those who adopt it win the prizes. Possibly the good results obtained on this plan may be due rather to the diminished intake of fat-forming food and the consequent reduction in weight than to the increased intake of proteid.

In the case of those habitually engaged in laborious occupations, such as navvies and agricultural labourers, the amount of proteid may be allowed to sink relatively to that of the carbonaceous food, inasmuch as the energy of muscular contractions is largely derived from non-nitrogenous food. It is because the labourer can readily burn off saccharides that he is better able to subsist on a vegetable diet than is a man leading a sedentary life. The latter, in order to obtain an adequate supply of

proteid from an ordinary vegetable diet, is apt to consume very large quantities of saccharide which, unlike the muscularly active man, he may find a difficulty in burning off. It must not be thought from this that the sedentary man can easily dispose of an excess of proteids : he is less able to do so than the muscularly active man. The point to be insisted on is that a purely vegetarian diet (unless specially fortified by vegetable proteids) often implies for him an excess of saccharides.

CHAPTER XXXVI

GENERAL REMARKS ON DIET

It has been my object in the preceding chapte enunciate certain dietetic truths which appear t important: to show some of the lessons that ma learnt from a study of man's past dietetic histor emphasize such facts as that man is an omnivo being; that it is his vegetable rather than his ar food that requires mastication; that starch can be, ought to be, by thorough mastication, largely digest the mouth; that an untold number of evils result the prevailing system of pap-feeding; that ofte much good can be got by reducing the carbonac constituents of the food (notably the saccharides) a proteids; that a long train of ills follows from eating; and that frequently it is much more usef reduce the total quantity of food than to prohibi particular item in it.

In this chapter I propose to refer to a few poin connexion with dietetics not yet touched upon.

SIMPLICITY IN DIET.

In prescribing a diet simplicity should alway aimed at.* I doubt if we sufficiently realize wh

* By a simple diet I mean one somewhat as follows—Brea Household bread; butter; ham; marmalade. Lunch or di

heterogeneous collection of substances many of us daily put into our long-suffering stomachs; and I venture to think that if an average day's allowance of food and drink were set out before us not a few would be surprised, if not alarmed, at the array. The articles displayed would probably include bread, butter, eggs, bacon, sugar, jam, fish, meat, potatoes, "greens," pudding, pastry, cake, stewed fruit, cheese, savoury "made" dishes, salad, raw fruit, sauces, spices, salt, pepper, vinegar, mustard, tea, coffee, beer, spirits, and wine. Imagine all these churned up together, and let the reader reflect that the whole of this strange conglomeration, containing perhaps double the amount of nutriment actually needed by the organism, has to be dealt with by stomach, bowel, and liver, and, if health is to be preserved, converted by them into nutrient plasma exactly suited to the requirements of the tissues. Small wonder if the task should often prove impossible.

It is only within comparatively recent times that man's dietary has been so complex. As we travel back to more primitive conditions, we find it becoming more and yet more simple, until, arrived at primeval man, we find him subsisting on uncooked natural products alone.

Simplicity, then, is one of the great desiderata in dietetics. The other two are moderation and the thorough mastication of all vegetable food. If these three essentials were always enforced, we should hear little of indigestion, such a disease as gout (except as due to lead-poisoning) would be unknown, nine-tenths of the work of dentists would disappear, and not a little of the misery of the world would be averted.

Clear soup; boiled fish with plain sauce; chop, or cut off a joint; boiled potato; milk or batter pudding; uncooked fruit.

But while it is advisable to live as far as possible on simple food, following the "plain living" Wordsworth connected with "high thinking" in a well-known line, it must not be supposed that diet should be monotonous. Quite the contrary. Here, again, we may learn a useful lesson from the habits of primitive peoples.

Season has a much greater influence on their diet than on our own. Thus it will be found that the food of the pre-agriculturists varies from month to month—nay, even from week to week. The Californian Indians, *e.g.*, consume in the early part of the year the bark of trees; then in due course, clover and roots; and about the middle of summer, salmon; after this come various kinds of seeds in their season, after them manzanita berries and pinon nuts, and finally acorns, while game and vermin of various kinds are consumed throughout the year. There is no such pronounced seasonal rotation of food as this among communities living in the modern cibicultural age. With the manifold facilities at our disposal for artificially producing, storing, and rapidly conveying food from place to place, we moderns are able to command much the same kind of food throughout the year. Butchers' meat, bird, fish, bread, rice, milk, cheese, butter, eggs, sugar, and some fruits and vegetables—*e.g.*, apples and potatoes—are available, even for those of limited means, at all seasons. It is only in respect of some highly perishable vegetable foods, such as green vegetables and certain fruits, that the influence of season makes itself decidedly felt, and this influence is every year becoming less as new methods of storage are devised and more rapid means of transit from remote parts provided. These same facilities, while making it independent of the seasons, also greatly add to the variety of modern diet.

Never before in the history of man has the whole world been placed, as now, under contribution to supply his table, nor such a wide variety of food put within reach of the many instead of the wealthy few.

The fact that we are descended from an ancestry whose diet has for untold ages varied considerably throughout the year undoubtedly helps to explain the evil effect of a monotonous diet and the advantage of varying it from time to time. This truth is well illustrated in the case of anthropoid apes kept in captivity. Obviously, under natural conditions the food of these apes changes with every month of the year, and the keeper in charge of those in the London Zoological Gardens tells me that he finds it necessary constantly to vary their food in order to keep them in health. We shall do well to bear this point in mind when called upon to regulate the diet of our patients. And this brings us to the consideration of diet in disease.

DIET IN SPECIAL DISEASES.

Some writers on dietetics appear to assume that every disease needs to be treated on a special dietetic plan ; that, *e.g.*, gout, Bright's disease, heart disease—all require special kinds of food. I believe this to be an utter fallacy. Let us be careful not to assume a knowledge we do not possess, nor to masquerade in a garb of mock wisdom. There are, of course, certain disorders, such as the acute fevers, diabetes, obesity, lithiasis, which demand special kinds of dietetic treatment ; and it may well be that with increasing knowledge we may some day be in a position to prescribe specific scientific dietaries for many other disorders. For the present, however, we shall find it wise, in our dietetic treatment of most diseases, to be guided by the simple

rule of allowing the patient to eat in moderation whatever he can digest. In other words, the ability of a patient to digest a food is the best indication as to whether it is good for him. This I believe to be a most important principle. In the majority of cases a food is injurious, not so much because it contains ingredients (excess of proteid, extractives, or acid) which, being absorbed into the blood, interfere with normal nutrition, as because it fails to be digested properly or interferes with the digestion of other foods, and in this way leads to the passage into the blood-stream of substances unfavourable to nutrition. I do not say that food may not sometimes, no matter how perfectly digested, contain substances which act injuriously in certain diseases. The acids of certain fruits circulating in the blood may, for instance, possibly be injurious in gout; but I venture to assert with some emphasis that just so far as the *nutrient material poured by the hepatic veins and the thoracic duct into the general blood-stream is the product of perfect digestion*, to that extent, and to that extent only, *will it be acceptable to the tissues*, whether of the healthy or the diseased, whether of the old or the young.

The best diet, *e.g.*, for the gouty man is one that is digestible and strictly moderate in quantity. Provided these requisites are fulfilled, we may allow our gouty patients any food they fancy.

It is well known that certain articles of diet—strawberries, for instance—may give rise to gouty or "rheumatic" symptoms, but it by no means follows that this is because they contain some substance which acts injuriously after absorption into the blood. It may simply be because the strawberries, especially if taken with an abundance of sugar and cream, interf-

digestion. What one frequently observes is that, while a particular food is injurious in certain combinations, in other combinations it is quite innocuous. Thus, if a patient is consuming a large quantity of meat, as well as a liberal allowance of saccharide, a dish of strawberries may bring on an attack of gout; but if, on the other hand, he cuts down his meat, or his saccharide, or both, he may find himself capable of consuming a large quantity of strawberries, not only without harm, but with actual benefit. Similarly, meat when consumed in large quantities, in conjunction with an ample supply of saccharides, is injurious in gout; but that it is not in itself necessarily harmful in this disease is shown by the fact that a gouty patient may often be greatly benefited by being put on a diet limited to lean meat and hot water. It can hardly be doubted that in such cases the benefit results, in large measure at least, from improved digestion. The stomach, bowel, and liver, no longer having to cope with a variety of different proteids, saccharides, and fat, as well as different drinks (such as tea, coffee, wines, and spirits), digestion is effected more perfectly, fewer poisons are produced, the toxicity of the blood sinks, and the health improves.

We have, then, to consider the suitability of any given article of food both when taken alone and when taken in conjunction with other things. By due attention to this point we may often allow articles of diet which would otherwise disagree. Thus, by making one meal—say breakfast—mainly vegetarian, and another meal—say dinner—to consist chiefly of animal food, we may find digestion, and health generally, better than when the two kinds of food are taken together in more equal ...tions, though no alteration is made in the actual ...ood each day.

THE DIETETIC TREATMENT OF INDIGESTION.

I find that most cases of indigestion yield to the following treatment: The food to be simple in kind and moderate in quantity; puddings, pastry, cakes, stewed fruits, and vegetables (except spinnach, cauliflower, and asparagus) to be excluded; farinaceous (flour-containing) food to be limited to bread-crusts and unsweetened biscuits, both of which are to be chewed until they are completely liquefied; grated Cheddar cheese allowed, and uncooked food in moderation; little fluid to be taken with meals, but a glass of hot water to be sipped on rising and retiring, and at 11 a.m. and 4 p.m. The less alcohol the better. A small quantity of tea (China) may in most cases be permitted; also coffee, ground at home and without chicory, made with three-quarters milk. No food should be allowed with the afternoon tea. The patient should rest half an hour after each meal. These rules need not, of course, be observed indefinitely; when sound digestion is established they may be gradually relaxed.

Cases not curable by this plan of treatment fall into three classes: those which are incurable; those which are curable by change of air; and those which can only be cured by suitable dieting coupled with rest in bed.

Regarding the second class, it is to be observed that there are a certain number of dyspeptics whom no amount of treatment, dietetic or other, at their own homes avails anything, but who can readily be cured by being sent to some congenial resort. It is not easy to explain how the altered conditions produce this effect, sometimes most striking, upon digestion; but there can be no doubt about the fact, which, therapeutically, is of the utmost importance. The dyspepsia which is most

strikingly benefited in this way is often of the "nervous" variety, and includes cases of menstrual dyspepsia—those, namely, associated with disordered menstrual function. I have already expressed the opinion that nine-tenths of the improvement in health derived from change of air is effected through the digestive system.

Coming now to the third class of dyspeptics, we find that some cases of inveterate dyspepsia which yield neither to the dietetic treatment described nor to change of air are amenable to rest treatment. The diet for these must be regulated according to circumstances. For some a reduced diet is demanded; others require feeding up. Among the latter there are some who will bear gorging at once, digesting quite easily, when kept warm and quiet in bed, articles of food which were intolerable while they were up and about. Other more inveterate cases need cautious dieting. These we may first place on a milk diet, gradually supplementing this with other kinds of food. In long-standing and obstinate cases I find it a good plan to limit the patient for the first week or ten days, or even longer, to whey, then gradually to replace this by milk, and afterwards to allow small quantities of buttered bread-crust, chewed until completely liquefied; later, breast of chicken and boiled fish may be given, and so on until all ordinary articles of food are permitted. It is generally advisable to have the patient regularly massaged all the time he is kept in bed.

CHAPTER XXXVII

A LECTURE ON DIET*

[Although most of the points dealt with in the following le
are referred to in the preceding pages, I am led to appe
for the purpose of emphasizing them.]

I BEGIN this lecture by a question: How far is
to be regarded as a vegetable feeder, and how fa
an animal feeder? As physicians, we ought to b
a position to answer it authoritatively.

That branch of vertebrates known as the mamm
falls, in respect of diet, into three classes: the pu
flesh feeders, or carnivora; the purely vegetable feed
which include the herbivora and many of the frugivo
and the mixed feeders.

Regarding the purely vegetable feeders, it will be
served that the herbivora, of which the horse, the
and the rabbit may be cited as examples, subsist
bulky, unconcentrated vegetable food, such as gras
leaves, and the like, and have a correspondingly bu
digestive system. The frugivora, which include anim
like the squirrel and the monkey, consume, on the ot
hand, a more concentrated vegetable food, such as t
find in seeds and nuts; being more intelligent than
herbivora, and gifted with no inconsiderable prehen

* Published in the *Clinic*

powers, they are able to pick and choose their food, and, as might be expected, their digestive system is much less bulky than that of the herbivora. Of the mixed feeders, including many of the frugivora, it is to be observed that their intelligence and ability to grasp objects enables them to procure a certain amount of animal food, which of all foods is the most nutritious. Thus we find squirrels consuming eggs as well as nuts, and many of the monkeys supplementing their vegetable diet by small birds, lizards, grubs, and the like.

We have now to ask, To which of the three great classes does man belong? Is he by nature purely carnivorous, or purely vegetarian, or is he a mixed feeder? In other words, which kind of diet best satisfies his digestive and nutritive requirements? There can be no doubt as to the answer. Man is naturally a mixed feeder, and that I may convince you of this fact I will ask you to travel back in imagination to the anthropoid stage of his evolution—the stage, *i.e.*, which corresponds to that of the existing anthropoids—the gorilla, chimpanzee, gibbon, and orang. We have beyond all doubt descended from a being closely allied to these creatures, and we are therefore justified in assuming that the diet of our simian ancestors was much the same as that of the present-day anthropoids, a conclusion rendered all the more certain by the remarkably close resemblance which exists between their digestive organs and our own. You see, then, what great interest attaches to the study of the diet of the anthropoid apes. Unfortunately, we do not know exactly what their natural food is; for, owing to extreme shyness, it is difficult to observe them ıder natural conditions. So far, however, as I form an opinion from the observations of

travellers and from my own observations of anthropoids in captivity, I cannot doubt that they are essentially frugivorous—*i.e.*, that they subsist chiefly upon concentrated vegetable food, nuts, seeds, and the like, supplemented, as in the case of other frugivora, by less concentrated kinds, such as young shoots and luscious fruits. But though these form the staple of their diet, there is no doubt that they also consume a certain amount of animal food, such as birds, snakes, lizards, eggs, insects, and grubs ; and from this we may safely conclude that our simian forbears, though essentially frugivorous, were to some extent carnivorous also, and must thus be classed among the mixed feeders.

It is a long leap from the highest ape to the lowest existing man, but I am going to ask you to take that leap. The most primitive peoples of to-day have not yet reached the cibicultural* phase of culture—*i.e.*, they neither cultivate the plant world nor breed animals for food, but subsist on wild fruits, seeds, roots, and such animal food as they can procure by hunting and fishing. These peoples, intensely interesting by reason of the link they constitute with our long-vanished progenitors, survive in parts of the world which by their remoteness and inaccessibility have afforded them protection from more advanced and powerful races, and I need hardly say that a study of their diet, preserving as it does its primeval simplicity, is of the utmost value to our present inquiry. I have been able to obtain, as the result of prolonged investigation, a fairly detailed account of it. It would appear, speaking generally, to be about one-half animal and one-half vegetable, though among different

* I have ventured to coin this word, inasmuch as we have need of a term signifying the artificial production of food, animal as well as vegetable. The term "agriculture" has not this wider significance.

pre-cibiculturists considerable differences obtain in the relative quantity of animal and vegetable food consumed. Thus some, such as the Esquimaux, are of necessity almost wholly carnivorous, while with others, such as certain acorn-eating Californian tribes inhabiting oak-forests, the proportions are about two-thirds of vegetable, to one-third of animal, diet. But setting aside these differences, the great point of interest is that none of the existing pre-cibiculturists are purely vegetable feeders, and in the light of this fact it is obvious that we cannot regard man as purely vegetarian by nature. There can, indeed, be no shadow of doubt that he is naturally a mixed feeder, for the uncultivated plant world does not afford the pre-cibiculturists a sufficiency of food, even though they all (with the exception of the Esquimaux, who in their barren, frost-bound haunts are compelled to subsist almost entirely on animal food) understand how to increase, and that considerably, the yield of vegetable food by special methods of preparation, whereby indigestible, acrid, and even poisonous substances are rendered wholesome and palatable. Thus, objectionable ingredients they remove by maceration and heat, while by means of pounding and cooking they break up the undigestible cellulose framework of vegetable tissue, thus liberating and rendering digestible the contained starch and other food-stuffs. The discovery of cookery was in truth an epoch in man's history, providing as it did the master key by which were unlocked vast storehouses of nutriment up to that time inaccessible. And yet, in spite of the fact that the pre-cibiculturists are able by it and other means greatly to augment their supply of vegetable food, they are compelled to supplement their dietary from the animal kingdom. They are, indeed, essentially hunters and

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as dogs, are made ill by much meat when kept in close captivity, whereas under a more active mode of life they are able to consume large quantities with impunity.

If, then, we are asked what kind of food is best suited to man's requirements—animal, vegetable, or mixed—we can unhesitatingly answer that a mixed diet most assuredly is, the desirable proportion of animal to vegetable in it varying with his mode of life; and we can explain how, for hundreds of thousands of years, man subsisted largely on animal food; how, during this, his most carnivorous period, he led a nomad life, which fitted this sort of diet to him; and how, now that he has become rooted to the soil, he cannot tolerate animal food to the same amount, though still capable of coping with considerable quantities of it.

While, however, we are, from the foregoing data, forced to conclude that man is largely carnivorous by nature, we must not lose sight of the fact that individual human beings differ considerably in their ability to cope with animal food. It is certain that much of it is bad for some, and that not a few thrive best on a diet that is entirely, or almost entirely, vegetable. Such persons are probably exceptional and may be regarded as being, in respect of their digestive and metabolic capacity, more nearly allied to the anthropoids than to the average individual—as constituting, in fact, reversions to a far-off ancestral type. That good can sometimes be effected, especially in the case of the gouty and headachy, by curtailing or entirely excluding animal food, there is not the slightest doubt. We can sometimes cure headaches simply by restricting the allowance of butcher's meat and bird; in other cases we may have to exclude these from the dietary altogether, allowing fish only; some-

times, again, it may be necessary to prohibit even fish, limiting the patient to ordinary vegetable food, together with milk, butter, and cheese, always taking care, however, as we reduce the amount of animal food, to supply the necessary quantity of proteid in the form of cheese, protene, plasmon, and the like.

I have said there are those who thrive best on a purely vegetable diet. How far, we may now ask, is it possible for mankind at large to become vegetarian? Civilized man has learnt to obtain from the vegetable world a much richer supply of nutriment, and this in a highly condensed form, than man in his earlier stages. For though pre-cibicultural man secures to himself a considerable proportion of his vegetable food in a compact and easily digestible form—*e.g.*, when he gathers seeds and grinds them into flour—civilized man can do much more than this. He knows how to extract from the vegetable kingdom pure starch, sugar, albumin, and fat, and by combining these in proper proportions, together with the requisite quantity of extractives and salines, it is possible to obtain in a highly condensed form food amply sufficient for his full nutrition. It has to be remembered, however, that such a dietary is highly artificial ; and the fact, which is undoubted, that some thrive on it does not justify the assumption that man is by nature purely vegetarian. Nor must it be forgotten in this connexion, that most so-called vegetarians consume a large quantity of milk, butter, and cheese, as well as eggs, all of which are derived from the animal kingdom.

Here I may point out, by the way, that this class of vegetarians cannot legitimately claim, as the few genuine vegetarians certainly can and do, that they subsist on a diet that does not involve the taking of life,

inasmuch as it would be absolutely impossible for either milk, butter, cheese, or eggs to be sold at a profit without most of the young bulls and cockerels being killed for the purpose of food. It is clear, therefore, that those who include dairy products and eggs in their dietary cannot claim to be wholly guiltless of the slaughter of dumb animals.

Now, obviously, physicians ought to be in a position to speak authoritatively to their patients on this question of animal, as against vegetable, food ; and this, I repeat, they assuredly are, for it is as certain as is the daily rising of the sun that present-day man is in his nature largely carnivorous. It may be a sad fact and a terrible that we, who claim to be the "roof and crown of things," should slaughter dumb animals and eat of their flesh, but so it is, and so for long ages it has been. It was, in fact, on highly carnivorous diet that during some hundreds of thousands of years our ancestors slowly mounted up the rungs of the evolutionary ladder which leads from the beast to the man ; on such a diet that man evolved the faculty of language, the power of self-analysis, of pondering on the past, and speculating as to the future ; on such a diet that he first dreamed of a life beyond the grave.

If, then, man has passed from such depths to such heights on richly animalized food, what folly to contend that food of this kind is necessarily poisonous to him! Man is omnivorous, and his extraordinary adaptability to foods of different kinds distinguishes him from all other animals. It is this adaptability, coupled with his skill in cultivating and preparing his vegetable food, that has enabled him in some parts of the world to become almost entirely vegetarian ; and it is this and this skill, fortified by a growing moral

sense, which will one day, perhaps, lead him to refrain altogether from eating that which has once throbbed with the pulse of sentient life. This may come; this, I think, ought to come. As at present constituted, however, man is by nature largely carnivorous, and it is idle to pretend otherwise.

I now propose to touch—very briefly it must be—on a subject no less important than the one we have just considered. Assuming the various food-stuffs—proteids, fats, starches, etc.—to be combined in due proportions, how much food ought a man to eat? The ideal quantity—which, however, may often be exceeded without hurt—is what we may term "the minimum normal," by which I mean the smallest quantity needful to maintain a man at his normal weight and in normal health and activity. But how, it may be asked, are we to know what is the normal weight? We may define it as the lowest weight compatible with the most perfect health and fullest activity of which he is capable. Hence the minimum normal diet is the smallest quantity of food adequate to maintain a man at the lowest weight compatible with the highest attainable level of health. Any quantity over and above this is useless, if not actually harmful. Young people often eat more than is necessary, and frequently, it would seem, without harm; but note this—that with every added year the power to cope with an excess of food steadily diminishes, and after middle life even a moderate excess is necessarily harmful. There are, of course, wide personal differences in this respect. Even children may suffer from quite a small excess, as evidenced by the deposit of lithates in the urine, by irritability of temper, and such like; while, on the other hand, some who are well on in years can tolerate with seeming impunity a large excess,

even two or three times the needful amount. I say "with seeming impunity," for doubtless they all do suffer from their gluttony, in that they fall short of the best attainable health. It is a fact, however, that some of them live to be very old. I recently dined at the same table with a voracious old gentleman of some ninety years who managed to dispose of at least double the amount of food which would satisfy the needs of many a younger man; and though one can hardly doubt that he would find life far more enjoyable (certainly those around him would, for he is not always in the most amiable of moods) if he reduced his food to within physiological limits, it must be confessed that he looks hale and hearty, and bids fair to weather out many another year. People of this class have prodigious digestive capacity.

We must not, therefore, be too dogmatic in dealing with this question of the quantity of food: we must be prepared to judge each case on its own merits. Some there are who, in order to attain the fullest measure of health, need always to restrict their allowance of food to the minimum normal, and with every year after the meridian of life the more urgently necessary does such a restriction become; but there are others who manage to live to extreme old age on a diet which greatly exceeds the actual needs of the organism.

In conclusion, let us briefly consider some of the evils resulting from eating too much. The most obtrusive of these is obesity, and this has many disadvantages. Not the least is the mere dead weight of the superabundant fat. Take a young man of twenty in full training—*i.e.*, without an ounce of superfluous fat—weighing, we will say, eleven stone, and now suppose

him at sixty to have put on six extra stones. Imagine what an encumbrance this extra weight must be, and how severely it must tax a heart which has long lost the elasticity and vigour of youth. Even in the young man quite moderate exertion, such as running upstairs, is competent to induce some breathlessness and palpitation, and this, mark well, in spite of youth and training. How incomparably greater, then, must be the strain of such an exercise in our man of sixty who is continually weighted with six stone of unnecessary adipose tissue, and on whose heart and arteries the inexorable process of senile decay has already begun to tell! Such a hypothetical case enables us to realize the imperative need of reducing the weight of elderly stout people, above all when there are indications of cardiac weakness.

Not only does obesity impose extra work upon the heart; it also greatly hampers the movements of respiration, and it is chiefly for this reason that stout people are so liable to pulmonary troubles, and so apt to succumb to them. With all stout bronchitic patients we should use every endeavour to reduce the weight to the normal.

Another evil resulting from over-eating is indigestion. Digestion is much more likely to be good on a minimum normal than on an excessive diet: the digestive organs can deal more efficiently with, and metabolism at large proceed more economically and easily on, a moderate than on an excessive diet. When a large quantity of food is eaten, gastro-intestinal digestion is defective, and the liver is burdened with an excess of imperfectly digested material which it is unable to pass on as normal plasma into the systemic blood-stream, and as a result the tissues are bathed in a plasma which is faulty both

from surcharge of nutriment and perversion of composition.

What, let us ask, becomes of the excess of absorbed nutriment? This is a question of great practical interest. You might think that the organism, after storing a sufficiency in the shape of such substances as fat and glycogen, would allow the surplus to escape unused, the excess of albumin and sugar, *e.g.*, simply draining off by the kidneys without suffering further change. But, except in cases of very great excess—as when very large quantities of sugar or eggs have been eaten—or in actual disease, this does not occur. What actually happens is this: After the limit of storage has been reached, *the whole of the surplus is chemically dealt with—metabolized, as we say—by the tissues*, especially by the muscles, which constitute the furnace, *par excellence*, of the organism.

Now, that the excess of food absorbed is not simply cast off unutilized, but is, on the contrary, laboriously metabolized in the laboratory of the tissues and worked off into urea, carbonic acid, water, and the like, is to my mind one of the most remarkable facts in the physiology of nutrition, and one the clinical importance of which cannot well be exaggerated. For what does it imply? It implies, as we all know, that an excess of nitrogenous food leads to an extra production of urea and kindred products; and it also implies—though this is not properly realized—that an excess of combustible food, whether in the shape of proteids, fats, sugars, or starches, leads to an *increase both in the output of carbonic acid and water and in the demand for oxygen.* Excessive eating, therefore, not only throws extra work upon the digestive organs and kidneys, but also upon the lungs, increasing as it does both the demand for

oxygen and the production of carbonic acid. It also puts extra work upon the heart, and, indeed, upon all the organs of the body.

It is of the utmost importance that we should be alive to this fact in the treatment of acute dyspnœa, whether cardiac or pulmonary. Dyspnœa is due to the accumulation of carbonic acid in the blood,* and inasmuch as every particle of absorbed food increases the production of this substance, it follows that in all cases of urgent dyspnœa we should give as little food as we dare. If it has ever been my privilege to save life—and we physicians need to be chary in taking to ourselves credit for so great an achievement—it has surely been by adopting this plan of treatment. I always prescribe a meagre diet in urgent cases of lung disease, such as pneumonia, and if called upon to treat a case of acute bronchitis in an obese person, I am rejoiced if I can persuade the patient to remain for some days entirely without food; nothing is so calculated to diminish the dyspnœa and relieve the overburdened heart in these cases as complete abstinence. The same plan should be adopted in acute cardiac dyspnœa.

The plan of reducing or altogether withholding food is, again, often useful in the acute phase of the specific fevers by the relief it affords the heart and circulation. When dealing with a case of enteric fever in which there is coma or delirium, do not hesitate to starve your patient; it is better that he should remain a few days without food than that his stomach should be distended with material which it is quite incapable of digesting.

* Haldane and Priestley have recently shown that the dearth of oxygen in the blood has nothing to do with the excitation of dyspnœa, thus settling a question which has been debated for nearly half a century.

And here let me say that in cases of failing heart we shall get far more good by carefully attending to the patient's diet than from the administration of alcohol, on which physicians have for so long relied as a cardiac stimulant, especially in acute febrile disorders. I have long been convinced that we can help the heart far better by carefully regulating the diet than by administering to it so evanescent a stimulant as alcohol. The custom has too frequently been to overburden and dislocate the heart by giving an excess of food (which not only creates the need for a more active circulation but also distends the neighbouring stomach), and, having done this, to pour in alcohol so as to stimulate its flagging energies. Surely the wiser plan would be to lessen the burden and dispense with the stimulus? A tired horse can travel farther with a light weight on his back and without any stimulus whatever, than when heavily weighted and at the same time constantly urged along with whip and spur.

We all recognize how greatly we can benefit our gouty and plethoric patients by reducing their food. Here is a case in point: A man, aged sixty-five years, came to me complaining of giddiness, fulness in the head, and flushes. He had had several attacks of epistaxis, which, if occurring constantly after middle life, suggest, as you know, granular kidney; and there was no doubt that he was suffering from this disease, for not only was his blood-pressure excessive, but he was passing a large quantity of water, with some albumin. Now, by restricting the diet and giving calomel and salines, the epistaxis, giddiness, fulness of the head, and flushings rapidly disappeared, and the patient expressed himself as feeling better than he had done for years.

I should like, before I end, to say that there need be

no fear that by pushing this plan of treatment the patient will be starved to death. People do not die of starvation so easily as is generally thought, and it is very difficult for the physician to kill his patients in this way. I have never myself seen anyone die from lack of food, except when the digestive tract has been obstructed—*e.g.*, from malignant disease—or in the all too familiar instances of neglected children among the poor, and in these cases death generally results rather from giving the wrong kind of food than too little of it. On the other hand, I am certain that many lives may be saved by a judicious reduction of the diet, even to the point of temporarily withholding it altogether.

I have spoken of the "minimum normal quantity of food," but have said nothing as to what on an average its actual amount is—certainly much less than most people suppose, not a few being able to maintain health and strength on so small a quantity as 10 ounces a day. And note, in this connexion, that the more thoroughly food is masticated, the less is the quantity needed; and not only so, but it is found that on this well-masticated reduced diet there is a general levelling up in bodily and mental vigour. Whenever, therefore, it is advisable to reduce the quantity of food to a minimum, insist upon thorough mastication.

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THE END

Baillı ... W.C.

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